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A Critical Revision of the genus Eucalyptus

BY

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.

(Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney).

Vol. III.

PARTS 21—30.

(WITH 40 PLATES.)

"Ages are spent in collecting materials, ages more in separating and combining them. Even when a system has been formed, there is still something to add, to alter, or to reject. Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages. In these pursuits, therefore, the first speculators lie under great disadvantages, and, even when they fail, are entitled to praise."

MACAULAY'S "ESSAY ON MILTON.'

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A Critical Revision of the genus Eucalyptus

BY

J. H. MAIDEN

(Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney)

Vol. III. Part 1.

Part XXI of the Complete Work.

(WITH FOUR PLATES.)

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DESCRIPTION.

CXIII. E. cinerea F.v.M.

In Bentham's *Flora Australiensis* iii, 239 (1866).

FOLLOWING is the original description :—

A moderate-sized tree, with a whitish-brown persistent bark, somewhat fibrous, the foliage more or less glaucous or mealy white.

Leaves opposite, sessile, *cordate ovate* or *ovate-lanceolate*, obtuse or acute, mostly 2 to 4 inches long (or narrow lanceolate, which are alternate and much longer.—J.H.M.).

Peduncles axillary or in short terminal corymbs, terete or nearly so, each with three to seven (or more.—J.H.M.) pedicellate flowers.

Calyx broadly turbinate, about 2 lines diameter or rather more.

Operculum conical, shorter than the calyx-tube.

Stamens 2 to 3 lines long, inflected in the bud; anthers small but ovate, with distinct parallel cells.

Ovary convex in the centre.

Fruit semiglobose or subglobose-truncate, about 3 lines diameter, often slightly contracted at the orifice, the rim thin, the capsule very slightly sunk but the valves protruding. (*B.Fl.* iii, 239.)

Normal form.—The normal form was long believed to be, as far as leaves are concerned, as defined by Bentham, as figured by Mueller in *Eucalyptographia* as *E. pulverulenta* Sims, and best known to New South Wales botanists as the "Argyle Apple." Many years ago I found narrow lanceolate leaves on the Argyle Apple, thus giving the foliage a distinctly dimorphic shape it was not previously believed to possess. To summarise, it has bark, fibrous; timber, reddish, of inferior value for economic purposes as a rule, but it would appear that the timber of variety *nova-anglica* is the most durable of that of any of the forms. Further data are required as to the durability of the timber of all the forms.

a. Flowers in threes.

b. Leaves mostly broad.

c. Yet lanceolate also in flowering branchlets.

Varieties.

1. *multiflora*, var. nov. (See p. 7.)
2. *nova-anglica*, var. nov. (See p. 9.)

SYNONYMS.

1. *E. pulverulenta* F.v.M., non Sims. (See p. 3.)
2. *E. Stuartiana secunda* of F.v.M. (See p. 4.)
3. *E. pulverulenta* F.v.M. var. *lanceolata* Howitt. (See p. 4.)
4. *E. Stuartiana* F.v.M., var. *cordata* Baker and Smith. (See p. 5.)

RANGE.

The species in its normal form occurs in northern Victoria, thence in New South Wales, in the southern mountainous country from about Tumut to Berrima, and thence in the Bathurst district. Connecting localities between the southern and western ones will doubtless be found.

"*N.S.W.*—Lachlan River near Bathurst, *A. Cunningham*, also Lake George, *Herb. F. Mueller*" are the localities quoted in *B.Fl.* iii, 239.

These are mentioned by Mueller in *Fragm.* ii, 70, for *E. pulverulenta* Sims, with which he had originally identified it. The locality "Lachlan River" is doubtless erroneous. Mueller's words in *Fragm.* are "In vicinia fluminis Lachlan oppidum Bathurst versus." There is no evidence that the species has been collected on the Lachlan, and probably Cunningham's Wattle Flat locality is referred to. The Lachlan reference is apparently a mere slip of the pen.

In the "Eucalyptographia" Mueller has the following localities for *E. pulverulenta* (F.v.M. non Sims).

(1) Upper Lachlan, (2) Cox's River, (3) Marulan to Yass, (4) Berrima, (5) Lake George, (6) Castlereagh River (the above are New South Wales). (7) Lake Omeo, (8) Buchan River, (9) Between the Avon and Mitchell Rivers, (10) Towards Walhalla (these are Victorian localities).

(1) Already referred to. (2) This is *E. pulvigera* A. Cunn. (*E. pulverulenta* Sims). (3), (4), (5) This is *E. cinerea*. I have not been able to confirm (6) for *E. cinerea*; the locality is farther to the north-west than that of any form known to me. Nos. (7) to (10) are all *E. cinerea* var. *multiflora*.

Typical Form.

New South Wales.

Limekilns near Wattle Flat, about 20 miles northerly from Bathurst. Locally called "Peppermint." Fine trees about 60 feet high. On the track taken by Allan Cunningham in April, 1823; see his "Journal of a route from Bathurst to Liverpool Plains," as described by him in Barron Field's "Geographical Memoirs on N.S.W." p. 133 (R. H. Cambage and J.H.M.).

Now we come to southern localities:—

Near Coal Mine, Berrima (J.H.M.); Jerrara, near Bungonia (H. J. Rumsey); "Blue Peppermint," Wingello (J. L. Boorman and J.H.M.); Barber's Creek (H. J. Rumsey; "Blue-leaved Apple" Marulan (A. Murphy); "Turpentine," "Messmate," "Bastard Stringybark." Typical of the forest growth on an extensive belt of country in the Jerrawa district. The country it grows in is useless for farming or grazing, as the soil consists of a barren sandy shale of Silurian age (Jerrawa Shales). See *Proc. Aust. Assoc. Adv. Science* xiii, 106 [1911] (A. J. Shearsby).

"Silver-leaved Peppermint," generally called "Turpentine, used for oil distillation. Fairly abundant in Gunning and Yass districts, and grows on very poor country along the small flats and watercourses". (G. H. Sheaffe).

Yass to Bowning, 2½ miles out, 1,600 feet above sea-level. (R. H. Cambage, No. 2,036); Yass (Revd. J. W. Dwyer). Tree about 30 feet, trunk matted stringybark up to branches, then strips off, near Gundaroo (Revd. J. W. Dwyer). About 40 feet; appearance of Stringybark. Bark ragged, fibrous, matted, reddish brown on trunk and larger limbs, then on smaller limbs coming off in strips and curling inwards, leaving creamy-white smooth branchlets." Nelanglo Creek, near Gundaroo, also hills near Burrinjuck and Goodradigbee (Revd. J. W. Dwyer).

Lake George (Revd. Dr. Woolls).

Tumut, in varying degrees of glaucousness (E. Betche, W. W. Froggatt). Tumut, West Blowering Road and Lacmalac (J. L. Boorman and J.H.M.).

VICTORIA.

"Peppermint." Fibrous bark up to 3 inches thick. Leaves all lanceolar. Beechworth (Falck).

AFFINITIES.

This species, while it has not many synonyms as compared with some species, has a most complicated synonymy, and I will endeavour to make the situation clear.

1. With *E. pulverulenta* Sims (the "pulverulenta confusion)."

In *Fragm.* ii, 71 (1860) Mueller, in identifying Bathurst and Lake George specimens (erroneously as we knew later) with *E. pulverulenta* Sims, says, he formerly distributed this species under the name *E. cinerea* F.v.M. (correctly as we knew later). This is the first mention of the name *cinerea*.

In 1866 Bentham (B.Fl. iii, 239) described the plant *E. cinerea* F.v.M. under Mueller's manuscript name. Bentham goes on to say :—

F. Mueller (*Fragm.* ii, 70) unites this (*E. cinerea*) with *E. pulverulenta*, of which it may be a variety, but as far as the specimens go, the differences in the leaf, in the size of the flower, and in the shape of the fruit appear to be constant. It may, however, be an opposite-leaved state of *E. dealbata*, and, possibly, as well as that species, a form of *E. viminalis*.

In this passage Mueller was referring to *E. pulverulenta*, the plant known as the "Argyle Apple," while Bentham had in his mind the true *pulverulenta* of Sims, of which *E. pulvigera* A. Cunn. is a synonym.

In the "Eucalyptographia" Mueller again erroneously placed his *E. cinerea* under *E. pulverulenta* Sims, and repeated this in his *Second Census*. Later on I followed Mueller, but Messrs. Baker and Smith ("Research on the Eucalypts") pointed out that *E. pulverulenta* Sims and *E. cinerea* F.v.M. were distinct, and that Bentham's views were correct.

1a. Then Howitt (*Proc. Aust. Assoc. Adv. Science* vii, 517 [1898]) founded his *E. pulverulenta* Sims (F.v.M.) var. *lanceolata* Howitt following Mueller as regards *E. pulverulenta*.

He says:—

1. Typical *pulverulenta* is not found in Victoria. (As regards the broad-leaved form he is correct so far as the records go, but he was not aware that his "typical *E. pulverulenta*" may have narrow lanceolate leaves.)

2. Only that form is found in Victoria with opposed, elongated lanceolar leaves in the aged trees, and this he called *E. pulverulenta* var. *lanceolata*.

He quotes the range of his variety as "Between the Pilot Range and Beechworth (F.v.M.), near the Ovens River (C. Falck), and in the Ovens district (D. Ingle). In Gippsland I have observed it near Buchan, at Providence Ponds (between the Avon and Mitchell Rivers), near Ostler's Creek, on the Walhalla Road, between Darlimurla and Mirboo North, at Monkey Creek between Sale and Port Albert, and at Moe."

He presented me with specimens of all he collected.

He says that the number of flowers in the head varies from three to six. His specimens were mostly multiflowered, and his variety *lanceolata* is my variety *multiflora* (in part) the exception being the three-flowered Victorian specimens. It is interesting to find that so keen an observer as Howitt believed that *E. pulverulenta* (as he understood it) included that *Stuartiana* which I have included in my *cinerea multiflora*. I invite my readers to peruse his very interesting paper.

2. With *E. Stuartiana* F.v.M. (the "Stuartiana confusion").

Now we come to *E. Stuartiana*, and the muddle becomes greater still.

I desire at the outset to point out that there are three *E. Stuartianas* F.v.M. in botanical literature.

(1) *E. Gunnii* Hook. f., var. *acervula* (*E. acervula* Hook. f.).

Let me call this *Stuartiana prima*.

(2) *E. cinerea* F.v.M., var. *multiflora* (*Stuartiana secunda*).

(3) *E. Stuartiana* F.v.M., the But But (*E. Bridgesiana* R. T. Baker) (*Stuartiana tertia*).

I shall return to the subject when I come to the plant which I have adopted as *E. Stuartiana* F.v.M., viz., the "But But," and again when I come to the *E. Gunnii* series.

Mueller, *Eucalyptographia* under *E. pulverulenta*, makes the following statement. (He has *Stuartiana secunda* in his mind's eye.)

"In the systematic definition and in the illustration I have not included a Eucalypt, the leaves of which in aged trees become elongated-lanceolar, much narrowed upwards, and even somewhat sickle-shaped, though their base remains

rounded and their stalk very short; moreover in the above-mentioned state some of the upper leaves become alternate or scattered. This particular Eucalypt was noticed in Upper Gippsland by Mr. A. W. Howitt, and near the Ovens River by Mr. C. Falck."

He goes on to say :—

"There is every reason to assume that it is merely a state of *E. pulverulenta* (*cinerea*) mediating a transit to *E. Stuartiana* (*cinerea* var.)" (my parentheses).

He goes on to say :—

"Indeed, it was with some reluctance that *E. pulverulenta* became at all accepted into the present work, from which all dubious species for distinct illustration have been and are to be rigorously excluded."

And again,—

"This finally narrow-leaved form of *E. pulverulenta*, when yet in its young bushy state, has the leaves all broad and opposite; but they do not continue in that form, contrarily to what is noted elsewhere."

These passages prove that Mueller felt—

(*a*) That *E. cinerea* in its typical form could not be separated from Howitt and Falck's specimens (p. 4).

(*b*) That *E. cinerea* was connected by a transit form with *E. Stuartiana* (that particular one which I have named *E. cinerea* var. *multiflora*).

He accentuates his view of the dimorphic character of *E. cinerea* when he adds :—

"As remarked already, *E. pulverulenta* (*cinerea*) is distinguishable from *E. Stuartiana* (*cinerea multiflora*) only in its foliage, holding the same relation to the last mentioned congener as *E. Risdoni* to *E. amygdalina*, as *E. melanophloia* to *E. crebra*. . . . . The bark of *E. Stuartiana* and of *E. pulverulenta* are very much alike." (My parentheses.)

At p. 523 of my "Useful Native Plants of Australia" (1889) I stated that *E. pulverulenta* Sims (*E. cinerea* F.v.M. was meant) is very closely allied to *E. Stuartiana* (*secunda*.—J.H.M.), and it is a question whether they ought not to be united."

2a. *E. Stuartiana* F.v.M. var. *cordata* Baker and Smith in "Researches on the Eucalypts," 105 (1902). In *Proc. Aust. Assoc. Adv. Science* ix, 348 (1902), Mr. Baker repeats that Howitt's *E. pulverulenta* var. *lanceolata* should now be *E. Stuartiana* F.v.M. var. *cordata*. Baker and Smith describe the flowers as more than three in the umbel; thus their plant is identical with my variety *multiflora*, though only in part with Howitt's var. *lanceolata*.

3. With *E. Gunnii* Hook. f. var. *rubida* Maiden (*E. rubida* Deane and Maiden).

When *E. cinerea* is in the lanceolate leaf stage, with its glaucous fruits in threes, the general appearance of the specimens renders them very liable to be

confused with the above tree. I have often been surprised at the similarity. The timbers are also a good deal alike, but *E. cinerea* has a soft fibrous bark, while that of *E. Gunnii* var. *rubida* has a smooth one.

In the *Abstract of Proceedings, Linn. Soc. N.S.W.*, 29th July, 1891, the Rev. Dr. Woolls exhibited some manna as from "*E. pulverulenta*" (*cinerea* was intended) at Buckley's Crossing, which really came from *E. Gunnii* var. *rubida*.

4. With *E. Stuartiana* F.v.M (*tertia*), the form I have adopted as *E. Stuartiana* F.v.M. I am now making a comparison with *E. cinerea* var. *nova-anglica*. (See below.)

Where the two forms occur together the latter goes by the name of Black Peppermint and the former White Peppermint or Apple. The former has a white zigzag or wrinkled bark, thicker and much paler in colour than that of the Black Peppermint. *E. Stuartiana* has thickish, fleshy leaves, largish fruits (in comparison), and of a different shape to those of var. *nova-anglica*. The foliage of *E. Stuartiana* is non-glaucous, except when young. Its buds are glabrous and of a different shape to those of var. *nova-anglica*. Its leaves possess a less odour of peppermint, and are often eaten by cattle.

5. With *E. cordata* Labill.

E. pulverulenta (*cinerea*) has the branchlets generally more slender and not acute-angular, the leaves not crenulated, but dotted with roundish almost uniform oil-pores, the flowers generally smaller, the tube of the flowering calyx downward obconically attenuated, while the lid is less depressed, the fruit is smaller, more top-shaped, and has a comparatively broader rim; the convergent free part of the valves emanates almost at a level with the calyx edge and arises not distinctly beneath the rim. The furrow between the discal lining and the calyx-tube is running just beneath the edge of the fruit, not forming a faint vertical channel around the rim. (*Eucalyptographia*, under *E. cordata*.)

Nevertheless, it is not always easy to separate *E. cinerea* from *E. cordata* on herbarium specimens alone. I have not seen *E. cordata* with flowers in more than threes; in *E. cinerea* this is not uncommon.

Compare Plate 84 (*E. cordata*) with Plate 89 (*E. cinerea*). In the typical forms of both species the flowers are in threes, but they are larger in *E. cordata*, and the fruits of *E. cinerea* are domed. The anthers are not very dissimilar and there is a good deal of resemblance in the leaves.

The leaves are usually thinner than those of *E. cordata*, but this is a character which must be employed with caution.

The bark of *E. cinerea* is always fibrous, partaking more or less of a Stringybark character, that of *E. cordata* is smooth or ribbony.

6. With *E. Risdoni* Hook. f.

Compare figure 1 of Plate 90 (*E. cinerea*, var. *multiflora*) with figure 1 of Plate 32 (*E. Risdoni*). There is a good deal of resemblance between the two species, both have stem-clasping and lanceolate leaved forms. But the anthers are different, the opercula are hemispherical in *E. Risdoni*, the fruits thin rimmed and not domed in the same species, while *E. Risdoni* is smooth barked.

7. With *E. globulus*, Labill.

E. pulverulenta, Link. (*Enumeratio*, page 31) is, according to Mueller "Eucalyptographia," *E. globulus* Labill., the confusion having undoubtedly arisen through the glaucousness and the shape of the sucker leaves of the latter. A specimen of *E. globulus*, probably collected by Verreaux, and labelled "*E. pulverulenta*, Tasmanie, No. 85, ex herbario Musæi Parisiensis, 1844," in herb. Barbey–Boissier, is additional evidence of the confusion between these two species that formerly existed.

If Plate 79 be referred to it will be seen that the relations of *E. globulus* Labill. and *E. cinerea* F.v.M. are not very close.

Varieties.

1. var. *multiflora*, var. nov.
2. var. *nova-anglica*, var. nov. (see p. 9).

[Further investigations in regard to the climatic variations of these two forms are necessary.]

1. var. *multiflora* var. nov.

A tree usually of medium size, but it may attain a height of about 100 feet, bark softly fibrous, branches smooth, timber reddish and inferior in quality. Juvenile foliage sessile, cordate or ovate lanceolate.

(*a*) Mature leaves cordate to lanceolate.

(*b*) Flowers in more than threes.

(*c*) The peduncles usually in both axils as in the normal form. It is this form that is depicted as *E. Stuartiana* by Mueller in the Eucalyptographia.

RANGE.

It would appear to be confined to south-eastern New South Wales and the eastern half of Victoria.

New South Wales.

Bark like mahogany, wood dark red when fresh. Grows 30 feet and 1 foot in diameter. Common in swampy heathy flats. Eden to Cape Howe, also Narrabarba to Victorian border (J. S. Allan).

"Bastard Box," grows to a large size, has a persistent Grey Box bark to the branches, found growing on high land. Grows from Shoalhaven to Victoria, near Wolumla (J. S. Allan). This specimen has pedicellate flowers like Figure 10, Plate 89, and differs somewhat from the preceding specimen, perhaps to be accounted for by its occurrence in better drained localities.

VICTORIA.

Bark fibrous, bark on upper ends of branches and on smaller branches almost quite smooth and clean, old bark peeling off in thin flakes. Leaves long, thick, heavy dense foliage. Mount Lookout near Bairnsdale (H. Hopkins). With pedicellate flowers like Figure 10, Plate 89, not to be distinguished from Allan's Wolumla (N.S.W.) specimens.

Buchan Road, about 7 miles south of Buchan. Also in various places throughout the lowlands of East Gippsland. Also along the road between Sale and Port Albert, and near Boolarra (the latter apparently a less coarse variety).

Bark, fibrous, rough, or somewhat scaly, or resembling a stringy bark, persistent on stem and branches. A small scraggy tree, occasionally, and as at Boolarra, attaining more shapely proportions, usually small not more than 20 to 30 feet high, on low sandy flats. Leaves of suckers and young saplings cordate or broadly ovate, sessile, opposite changing in older trees to longer and narrower, shortly stalked opposite or alternate, or frequently without stalks, sessile opposite but elongated leaves on old trees, and all kinds quite commonly found on the same adult tree. Old leaves thick and leathery, young foliage often the same, but generally thinner and softer and dull green, or most frequently covered with a thick white or bluish "bloom," as is also the buds and small branchlets, giving the tree a "silvery" appearance, hence the local name "Silver-leaved Stringybark." Wood is dense, hard and sound. Appears from the débris in the bush as if it would be durable. So far as I know it is not used for any purpose. Bark and wood appears to resemble the *Syncarpia* (Turpentine) of N.S.W. (H. Hopkins).

"Red Stringybark," grows on swampy ground. Buchan (T. O'Rourke through A. W. Howitt).

The following additional specimens were collected by Mr. (afterwards Dr.) A. W. Howitt.

Oakleigh (near Black Flat); Monkey Creek, South Gippsland; Moe (leaves mostly cordate and up to eight flowers in axils); Croydon; Boolara; Dargo Road, North Gippsland; Bunyip.

The following is an excellent account of the tree as it occurs in the Melbourne district.

"Council's Hotel, about 12 miles from Melbourne on the Lilydale road to Healesville. It is very plentiful along the road about 15–18 miles from town. The tree is about 80 feet high, bark stringy but soft, somewhat between *E. macrorrhyncha* and *obliqua*. One observer calls it Mahogany because of the colour of the timber, the latter being apparently of poor quality. Towards Anderson's Creek it is sometimes called Apple Gum for want of a better name; near the Antimony Mines it is the ordinary Stringybark." (Late J. G. Luehmann).

Nunawading (D. Boyle, J.H.M.); Dandenong Mountain (F. Mueller, D. Boyle, J.H.M.); Ringwood (C. Walter, R. H. Cambage).

2. Var. *nova anglica*, var. nov.

(*a*) Flowers in more than threes.

(*b*) Mature leaves always lanceolate, *i.e.*, it never flowers in the broad-leaved stage.

(*c*) The peduncles usually not in pairs in the axils as in the normal form and var. *multiflora*.

SYNONYM.

E. nova-anglica Deane and Maiden in *Proc. Linn. Soc. N.S.W.* xxiv, 616 (1899). (With a plate) described as follows:—

It is gregarious and occupies considerable areas, often to the exclusion of other arboreal vegetation (J. F. Campbell).

Bark.—Dark straight bark (hence the local name "Black Peppermint"), thinner than that of *E. Stuartiana* ("White Peppermint" or "Apple"). Semi-persistent on the trunk, more or less ribbony on the boughs and deciduous on the ultimate branchlets.

Timber.—Of a pinkish or pale red colour when fresh, drying to a pale colour. It is of a soft nature, liable to rapid decay on reaching maturity. Of no commercial value, but used for fencing in the absence of more durable timber.

Sucker Leaves.—Intensely glaucous, often 3 inches long and 2½ inches broad. Orbicular to cordate, often stem-clasping. Twigs inclining to quadrangular in very early stage.

Mature Leaves.—Lanceolate, and, when fully mature, 3 to 4 inches long, and half an inch wide on the average. Veins strongly marked, pinnate and anastomosing, the intramarginal vein at some distance from the edge, the midrib and the intramarginal veins often pink, as are sometimes the other veins, while the leaf itself is often suffused with a tinge of the same colour. On the same twig it is a common occurrence to obtain the ordinary mature glabrous foliage interspersed with abundance of glaucous foliage of similar shape and of various stages towards the normal sucker foliage. The foliage has a strong peppermint odour. The twigs are round.

Buds.—From two or three to six in an umbel, but clusters of four or five are commonest. On a flattened stalk of about a quarter of an inch, the stalklets less flattened and less than half the length of the stalks. The buds glaucous and often pink or purplish, ovoid, the top of the operculum somewhat pointed. The operculum usually about the same size as the calyx-tube.

Flowers.—The flowers are usually borne in great profusion, with bright yellow filaments. Stamens apparently all fertile and inflected in the bud; anthers with parallel, distinct cells, style of moderate length, the stigma nearly flat-topped and dilated a little, the appearance of the dilatation being increased by the constriction caused by the drying of the filament.

Fruits.—Variable somewhat in size, but always under a quarter of an inch in diameter; usually glaucous, but sometimes entirely glabrous. In shape nearly hemispherical, with a well-defined more or less domed rim; the valves, which are indifferently three or four in number, exserted, and sometimes well exserted.

Size.—"A healthy mature tree seldom exceeds 6 feet in girth, after which it becomes a shell of much larger proportions, and grows to a height of some 50 feet and more." (J.F.C.)

RANGE.

This variety appears to be confined to New England, New South Wales, and the extension of that elevated table.land into Southern Queensland.

"Black Peppermint." Walcha and New England generally (J. F. Campbell); Bergen-op-Zoom and Walcha. (J.H.M.); Yarrowitch to Tia and Walcha (J.H.M.).

Besides "Black Peppermint" this species also goes under the name of "Red Peppermint" in New England. Mr. J. F. Campbell, of Walcha, tells me that it grows on slate and basaltic flats of fair quality of soil. It prefers the clay soil derived from the silurian slate to that of the heavier basalt on the lighter granite. I have seen large quantities of manna produced by this variety.

"The timber of this species is very good as posts, but apt to split in seasoning. A dead tree, apparently quite sound when cut through the sap timber, has cracks running into the heartwood. At the Int. Exh., 1879, I exhibited a piece of a post made of a young tree of this species 10 inches in diameter. The log was split in halves and used for posts. It had been erected about 1844, and was quite sound when dug up." (A. R. Crawford, Moona Plains, *in litt.*)

Tree of about 50 feet. Bark grey, and of "box" character, up to small branches, which are smooth. Between the Chandler and the Styx Rivers, Armidale district. (A. W. Howitt.)

Langothlin, near Guyra. (W. Dunn.)

"Red or Black Peppermint." Tingha to Guyra, 21 miles from the latter, and thence very abundant on flats and level land (R. H. Cambage, J. L. Boorman, and J.H.M.).

Ben Lomond, top of the mountain (J.H.M.); Deepwater (J. L. Boorman); "Peppermint Box," bark rough, rather fibrous; Glen Innes (H. Deane); "Red Peppermint," Cottesbrooke, and Tenterfield to Sandy Flat generally (J.H.M.); "Black Peppermint," Boonoo Boonoo (J. L. Boorman); "Peppermint," Gwydir, 13th April, 1843 (Dr. L. Leichhardt).

"Tall tree, trunk seldom of much diameter. Peppermint, New England" (C. Stuart). Doubtfully referred to *E. viminalis* by Bentham.

QUEENSLAND.

Stanthorpe (J. L. Boorman; also collector of F. M. Bailey); Killarney (Collector of F. M. Bailey).

DESCRIPTION.

CXIV. E. pulverulenta Sims,

With t. 2087, *Bot. Mag.* 1819.

FOLLOWING is the original description :—

Operculo hemisphærico, foliis oppositis orbiculato-cordatis integerrimis subcucullatis pulverulentis, pedunculis trifloris axillaribus cum floribus folia brevioribus.

It was of course accompanied by a plate. Sims designated it "Heart-leaved Eucalyptus."

It was then described by Bentham in the *Flora Australiensis*, B.Fl. iii, 225, with the note that "F. Mueller (*Fragm.* ii, 70) considers this to be the same as his *E. cinerea*, but as far as our specimens go, it appears to differ in the foliage, in the larger sessile flowers, and in the larger thicker fruit with a very prominent thick rim."

Mueller did not change his opinion, and in his "Eucalyptographia" figured, as *E. pulverulenta* Sims, his own *E. cinerea*. Subsequently Mr. R. H. Cambage rediscovered it, for it is a very local species, and it was identified as *E. pulvigera* A. Cunn.; and by Messrs. Baker and Smith as the original *E. pulverulenta* of Sims, thus confirming Bentham's contention.

As regards the "Eucalyptographia," not only did Mueller figure *E. cinerea* as *E. pulverulenta*, as already narrated, but he figured *E. cinerea* as *E. Stuartiana*.

SYNONYMS.

1. *E. pulvigera* A. Cunn.

In Allan Cunningham's Manuscript Journal of a journey to Bathurst, p. 8, is the following entry :—

Cox's River, 8th Oct., 1822. A species of Eucalyptus related to *cordata*, Labill., also afforded me good specimens, viz. :—

E. pulvigera fruticosa albo-glaucescens, operculo hemispherico *acuto* foliis oppositis sessilibus basi subconnatis suborbiculatis retusis, apice cuspidatis margine incrassatis undulatis, umbellis axillaribus pedicellatis 3-floris oppositifolius, pedicellis brevissimis teretibus.

A large shrub about 8 feet high.

Subsequently in Barron Field's "Geographical Memoirs on New South Wales," p. 350 (1825), he described it under the name *E. pulvigera* in the following words :—

Fruticosa, albo-glaucescens, operculo hemisphærico acuto, foliis oppositis sessilibus basi subconnatis suborbiculatis retusis, apice cuspidatis, margine incrassatis undulatis, umbellis axillaribus pedicellatis 3-floris, pedicellis brevissimis teretibus, Near Cox's River.

On the type specimen at Kew its locality is described as "Rocky Hills, Cox's River."

Sprengel, *Syst. Vegetabilium* ii, 501, has "E. pulverulenta Ker, operculo submutico, pedunculis 3-floris, foliis oppositis cordato-orbiculatis subcucullatis pulverulentis."

In DC. *Prod.* iii, 221, it is described under *E. pulverulenta* Sims, and *E. cordata* Hort. Berol. is quoted as a synonym. I have seen a specimen, and it is *E. pulverulenta* Sims (*E. pulvigera* A. Cunn.).

In D. Don's *Gen. Hist Dichlam. Plants* ii, 821, *E. pulverulenta* Sims is quoted for Sims' *Bot. Mag.* t. 208, and as distinct from *E. pulvigera* A. Cunn. Although he quotes *E. pulverulenta* as introduced into cultivation in 1816 (Sims' figure is dated 1819) and *E. pulvigera* in 1824 (Cunningham collected it in 1822), the two descriptions he quotes do not sufficiently contrast the plants to show whether he really is describing two species or not.

One can fairly surmise how *E. pulvigera* (Sims' *pulverulenta*) got into cultivation as early as 1816. Certainly the original grower did not get seed so early from Allan Cunningham, who only arrived in New South Wales in December, 1816. It is probable that it was collected during Macquarie's progress to Bathurst in 1815, and that it may have been collected by Lewin, who was artist and naturalist. Under date 30th April, 1815, Major H. C. Antill notes in his diary near the Cox's River:—

"After divine service was over, some of the party mounted their horses and took a ride to Mt. Blaxland, and another gentleman and myself took a sober walk up the river for about 2 miles, where we met with a waterfall extending across the river. . . . Having collected some seeds and plants along the bed of the river on the way up," &c.

The track, such as it was, passes near a patch of *E. pulverulenta* Sims, not far from the foot of Mt. Blaxland, while it would be a temptation to ascend Mt. Blaxland, and seeds of this peculiar looking plant would form a memento of the ascent. It could have been got nowhere else, although there is no specific mention of the collection of seed of it until Cunningham collected it seven years later and called it *pulvigera*.

2. *E. rigida* Hoffmg.

Mueller, "Eucalyptographia," indicates *E. rigida* Hoffmg., as probably referable to *E. pulverulenta*. I threw doubt upon this suggestion at vol. 1, p. 274, of the present work, since I followed Mueller in looking upon the plant under reference as *E. pulverulenta* F.v.M. non Sims (*E. cinerea* F.v.M.), whose foliage is not specially rigid; but the word rigid would certainly be appropriate to *E. pulverulenta* Sims (*E. pulvigera* A. Cunn.), and so Mueller's surmise was sounder than he thought it was.

3. *E. cordata* Loddiges non Labill., *Bot. Cab.*, t. 328 (1819).

It is stated to be "a native of Van Diemen's Land," which is a mistake. Also, that "we cannot entertain a doubt of this plant being the *E. cordata* of Labillardière." See also,

"232 *E. cordata* Loddig. *Bot. Cab.* Hab. in Australia. Eucalypti species rarisissime in hybernaculis florent, et in foliis simillimæ sunt, hinc difficile dignoscuntur, dubias itaque tantum licuit proponere species" (Link's *Enumeratio*, p. 31.)

And again

Eucalyptus cordata, Lodd. Caulis teres. Folia opposita, vix subcordata, sub-transverso-orbiculari-ovata, brevissime obtuse apiculata, glabra, pruinoso-glauca, membranaceo-coriacea, subtiliter reticulato-venosa, 1' lg., 1¼' lt. Odor et sapor partium omnium valde aromatica. (Hoffmg. *Verz. Pfl. Nachtr.* ii, p. 232).

RANGE.

It is confined to New South Wales, so far as we know, having only been found in three localities—around and upon Mt. Blaxland, just over the Blue Mountains, also near Apsley in the Bathurst district, about twenty miles further westward.

The only other locality is near Cooma, in the southern district, and it is not improbable that it may be found in intermediate localities. At no place is it abundant. It is a scraggy, spindly, tall shrub, apparently a disappearing species.

There are three specimens on one sheet in Herb. Cant. ex herb. Lindl., bearing two labels,

1. "Interior of New Holland, Major Mitchell's Expedition, 183—"
2. "Height, 7 feet; habit, weeping; summit of Mt. Blaxland, Fraser."

These specimens bear the label "*E. pulvigera*" Cunningham, and are identical with Cunningham's type specimens.

No. 1 specimen was probably collected on the Expedition on which Richard Cunningham was killed (1835).

No. 2 specimen was probably collected during Oxley's expedition to the west in 1817, when Allan Cunningham was collecting for Kew, and Fraser (afterwards Superintendent, Sydney Botanic Gardens) was collecting for Earl Bathurst. Whether Cunningham first named it on the 1817 trip, I do not know. I have already quoted his 1822 diary, which is the first allusion to this species by him known to me.

Cox's River, where it was collected by Allan Cunningham and described by him as *E. pulvigera* in Barron Field's "Geographical Memoirs on N.S.W." (R. H. Cambage and J.H.M.).

Fifteen feet high and up to 3 inches in diameter. A long, weak trunk of pretty uniform diameter—say 2 inches, on the average—quite prostrate, quite erect, and also spreading and rambling. Smooth gum, small ribbons. Circular leaf scars all round trunk. Peduncles up to half an inch. On the summit of Mt. Blaxland, and also on ridge one mile north of Bridge.

Small trees from 10 to 30 feet long, about 3 inches in diameter. Wood pale colour, tough; bark white, showing ribbons; leaves glaucous. Apsley, Bathurst, west of the road between Rockley and Perth. On the south side of hill, in mica schist formation (R. H. Cambage).

On Silurian slate hills near Cowra Creek, about 20 miles north-east of Cooma, 10-15 feet high. Scarce, occurring in small patches of an acre or so (R. H. Cambage, No. 1,922).

AFFINITIES.

1. With *E. cinerea* F.v.M.

Both under the present species and under *E. cinerea* F.v.M. I have given a full account of the confusion which has arisen between these two species. It is the normal form of *E. cinerea* which has been confused with it, before it passes into the lanceolate form. *E. pulverulenta* is a much smaller plant, has smooth bark with ribbons, the leaves are more rigid, and the fruits are larger.

2. With *E. melanophloia* F.v.M.

Compare Figures 1–4 of Plate 54. This is another cordate, sessile leaved species, but the fruits of *E. pulverulenta* are in threes and much larger and sessile, while the anthers are different. *E. melanophloia* is an Ironbark, and a tree.

3. With *E. cordata* Labill.

See p. 283, Part XIX of the present work.

Compare also Plates 83 and 84. *E. cordata* may attain the size of a fairly large tree; *E. pulverulenta* is always a spindly shrub. The leaves of the former are more or less ornate, those of the latter are entire and thicker. The tips of the valves of the fruits of *E. pulverulenta* are usually more exsert. But it is obvious that the species are closely allied.

DESCRIPTION.

CXV. E. cosmophylla F.v.M.

Trans. Vict. Inst. 32 (1855).

SHRUBBY, leaves alternate, thick, coriaceous, opaque, glaucescent ovate or falcate-lanceolate, cuspidate-acuminate, thinly veined, destitute of pellucid dots, peduncles short, axillary, angulate, with one–three large flowers on thick pedicels, lid hemispherico-depressed, mutic or umbonate, or conically pointed, tube of the calyx obconico-bell-shaped, with two indistinct ribs, a little longer than the lid, fruits half-ovate, not contracted at the orifice, valves of the capsule nearly enclosed. On stony places in the Lofty and Bugle Ranges (South Australia). One of the handsomest species of this extensive genus.

A little later on it was described by Miquel in the following words :—

Eucalyptus cosmophylla F. Müll.: ramis cylindricis, ramulis angulatis et compressis, foliis ovato-lanceolatis falcatis acuminatis, basi æquali vel inæquali in petiolum decurrentibus, coriaceiis, margine incrassatis et leviter recurvis, glaucis, supra subnitentibus, subtus opacis, pedunculis crassis angulatis vulgo trigonis trifloris, floribus sessilibus, calycis tubo obovato vulgo quadricostato basi imbrevissimum quasi pedicellum constricto, operculo semigloboso brevi-acutiusculo quam tubus paulo breviore.

In jugis montium Lofty Range (F. Müll.).

"Frutex spectabilis foliis 3–5 poll. longis, 1–2 latis. Flores nondum expansi rugulosi cum operculo semipollicares vel longiores, fl. autumno." (F. Müll. mss.) Folia speciminum suppetentium vulgo pollice angustiora venulis patulis prope marginem unitis subdistinctis, Pedunculi 2 lin. vulgo longi, calycis tubus fere tres lineas æquans. Antheræ ellipticæ.

Forma *leprosula*, ramulis tenuioribus angulatis cum pedunculis et inflorescentia scabritie albida evanescente obductis foliis longiuscule petiolatis (petioli majores pollicares) falcato-lanceolatis acutis vel obtusatis, 3–4 poll. longis, ½–1 latis, pedunculis cylindricis vel compressis trifloris 2–2½ lin. longis, floribus brevissime pedicellatis (pedicellis ancipitibus), calycis tubo turbinato infundibuliformi. Crescit cum specie.

(Miq. in *Ned. Kruidk. Arch.*, iv, 134 (1856).

It was subsequently described by Bentham in B.Fl. iii, 225, and described and figured by Mueller in "Eucalyptographia," who speaks of it as "a rather tall shrub, seldom somewhat arborescent." This must be modified, as it sometimes attains the height of a middle-sized tree. Following is a note given me by Mr. Walter Gill, Conservator of Forests of South Australia.

I came across a tree in the Hundred of Kuitpo which measured 2 feet 6 inches through and 14 feet of a trunk before branching, and then carried a head reaching to quite 50 feet from the ground. I have seen others of a fair size in the same locality, but that was the biggest.

He described the bark in the following terms :—

The bark on parts of the trunk where the growth is new is usually of a pinkish grey or bluish grey similar to the Red Gum (*E. rostrata*), but on the parts where decortication has not taken place it resembles more the pale brown colour and general leathery appearance of a thick linoleum of good quality. The bark comes off in irregular patches and never hangs in strips, and for the most part the general appearance of a trunk is smooth shiny-grey, purple or pink being the preponderating colour.

Standing in front of a tree on one occasion I described its bark as "smooth-flaky."

The timber is of a red colour, and not of great economic importance. Mr. Gill gave me the following notes :—

I took the opportunity of working some of it at Kuitpo, and on mortising the holes for slip-panel rails, found the timber to be quite the easiest cutting gum I have yet come across, as the chisel cuts it readily and the auger bores it with equal facility. So easy does it seem after working other gums such as *leucoxylon, obliqua and fasciculosa*, that one almost begins to doubt its value for lasting. And yet I find that people in the districts where it does not grow are in the habit of getting it if they can for stockyard posts, as, combined with its easy working nature, it possesses a character for lasting well in the ground.

I found it to split readily on the quarter, but to "back" badly with irregular fracture along the annual rings of growth.

It is called "Scrub Gum" by some, but has, I believe, other vernacular appellations.

The foliage is usually thickish and coarse, but it varies somewhat in size.

This species obeys the general rule that leaves are much smaller when taken from the top of a tall tree.

Varieties.

Mueller distributed two named varieties of this species, but he lost sight of them in recent years, and may have abandoned them altogether.

1. Var. *leprosula*. Following is a translation of the description already given :—

Branches rather slender, angular, the peduncles and the inflorescence covered by a whitish evanescent roughness. The leaves have somewhat long petioles (the petioles are thicker by a thumb's breadth), falcate-lanceolate, acute or obtuse, 3-4 inches long, $\frac{1}{2}$–1 broad, peduncles cylindrical or compressed, 3 flowered, 2–2$\frac{1}{2}$ lines long, flowers shortly pedicellate (pedicels ancipitous), the calyx-tube turbinate and funnel-shaped.

I saw a specimen in Mueller's handwriting in a European herbarium labelled "Mt. Lofty, has *calyx more angled* and *operculum* more *pointed* than usual" (see notes on the figures at page 22).

2. Var. *rostrigera*. I have not seen a formal description of this, but a label by Mueller reads as follows :—"Var. *rostrigera*, Ferd. Müll., Mt. Barker Ranges. *Operculum more beaked than usual.*"

RANGE.

It is confined to South Australia, chiefly in the ranges around Adelaide, and to Kangaroo Island. In the island it is called "Bog Gum," since it grows in stagnant, swampy depressions; at the same time Mueller quotes Waterhouse as finding it on bushy ridges. On the mainland it is not found further from Adelaide than the hills around Encounter Bay.

In Mt. Lofty Range often accompanied by Stringybark (*E. obliqua*) and Pink Gum (*E. fasciculosa*) (W. Gill). Following are specific localities for some specimens in the National Herbarium, Sydney :—The Mount Lofty Range generally; "Blue Gum," Mt. Lofty (Max Koch); Mylor (W. Gill); Bridgewater (J. M. Black); Aldgate (R. H. Cambage and J.H.M.); Kuitpo Forest, near Willunga (W. Gill); Harriet River, Kangaroo Island (Dr. and Mrs. R. S. Rogers); Kangaroo Island (J. Staer).

AFFINITIES.

Bentham places it in his section Normales (sub-series Subsessiles), and states its closest affinities to be *E. globulus* and *E. alpina*. Mueller ("Eucalyptographia") comments on the affinities to *E. alpina*, *E. Preissiana*, and *E. megacarpa*.

1. With *E. alpina* Lindl.

"From which the more pointed generally elongated and not shining leaves, the presence of flowerstalks, the larger flowers, smooth calyces with thinner lids, the oval anthers and the less hemispheric fruits readily distinguish it." (Mueller).

Attention is invited to Plate 41, Part IX. of this work. There is a good deal of similarity in the leaves. The large fruit depicted at 5*b* of Plate 41 resembles that of *E. cosmophylla* a good deal, but it and the other fruits of *E. alpina* are more domed. *E. alpina* is a stringybark, and in anthers and buds it is very different from *E. cosmophylla*.

2. With *E. Preissiana* Schauer.

It might be likened to the still more ornamental *E. Preissiana*, but that species has often partially opposite or nearly opposite, mostly quite blunt, and still thicker leaves of more vivid and somewhat shining verdure. Its flowerstalks are generally longer and always broadly compressed, and at first turned downward; the flowers and fruits are in most instances larger, sometimes much so; the filaments are bright yellow, the rim of the fruit is more descending, the valves generally somewhat deeper enclosed and outward tumid, and the seeds larger, as well as more uniformly broad. (Mueller).

To this may be added that *E. Preissiana* is always a small shrub. Examination of Plate 78 shows the two species are sufficiently distinct.

3. With *E. megacarpa* F.v.M.

It verges in its affinity somewhat to *E. megacarpa*, although that species forms a good-sized tree, has narrower, thinner and darker leaves, broader and flat flowerstalks, larger at the base, rather less turgid fruits, with finally convex emersed summit and very thick valves, larger and also broader sterile seeds. (Mueller).

The two trees have some similarity in habit, although *E. cosmophylla* is uniformly larger. The barks have some resemblance, although that of *E. cosmophylla* is thinner and more flaky; the timber of *E. cosmophylla* is red. Comparison of Plate 78 shows that the leaves have some affinity, so also have the buds, but the anthers and fruits are very dissimilar.

4. With *E. pulverulenta* Sims.

Examination of Plate 91 shows that the fruits of the two species bear a strong resemblance. The anthers are not very dissimilar, but I am not able to indicate any closer affinity.

5. With *E. Oldfieldii* F.v.M.

I only see affinity in the shape of the buds; the anthers are very different.

DESCRIPTION.

CXVI. E. gomphocephala A. P. DC.

Prod. iii, 220 (1828).

FOLLOWING is the description :—

Operculo hemisphærico obtuso substriato cupulâ multo latiore et fere longiore, pedunculis anticipitibus petioli longitudine subterminalibus, floribus 3–4 umbellato-capitatis, foliis lanceolatis acuminatis coriaceis. Hab. in Nova-Hollandia. Operculum fere pileiforme, in meis speciminibus adhuc indehiscens. Petala 0, stamina numerosissima. Fructus angulato-compressus subturbinatus 4– locularis. Petioli pollicem longi teretes. Folia glauca, nervo medio unico prominulo avenia 5 poll. longa poll. lata.

It was figured in his "Mémoire sur la Famille des Myrtacees" (*Mem. Soc. Phys. et Hist. Nat. de Génève* ix, t.11, 1842), but no further particulars are given.

It was described by Bentham at B.Fl. iii, 231, and subsequently by Mueller in the "Eucalyptographia." The drawing of the (immature) fruits in his plate is unsatisfactory.

The timber is pale coloured and of a yellowish cast. It is cut commercially and resembles such timbers as *E. leucoxylon* and *E. cladocalyx*. The bark is subfibrous (matted) reminding one of the "Box" trees (*hemiphloia*) of Eastern Australia, except that the branches are not smooth and therefore have no ribbons. The resemblance is closer to *E. Stuartiana*, "Apple tree" of Eastern Australia.

The most obvious character of this species is the much greater diameter of the operculum as compared with the calyx-tube (cupula). The original described aptly alludes to it as "pileiform," reminding one of a mushroom. To have the operculum of greater diameter at all, no matter how little, is unusual in Eucalyptus.

Mueller quotes *E. robusta* and *E. Watsoniana* in this comparison, and also *E. cladocalyx* (*corynocalyx*) and *E. urnigera*.

One may add *E. oleosa, torquata, incrassata, goniantha, Griffithsi*, but in no case is the character so marked as in *E. gomphocephala*.

The especially strap-shaped common peduncle, with the young buds, almost sessile, arranged along the broad top, and not at one point, so as to give the appearance of an umbel when young, gives the young buds a peculiar appearance.

Such an arrangement may be also seen in *E. obcordata* var. *nutans* and *E. redunca*.

The fruits are large, bell-shaped, and therefore dilated at the orifice; they are usually ribbed, as is often seen more or less in fruits of the genus.

The name universally given to this tree and its timber is Tuart; it is of aboriginal origin, and it was originally spelled Tewart.

Hybridism.—Dr. Trabut's *E. gomphocornuta* is a hybrid of which *E. gomphocephala* is undoubtedly one of the parents. I will return to the matter when dealing with hybridism in the genus.

RANGE.

It is confined to Western Australia, and to that coastal strip of the south-western portion of it parallel to the Indian Ocean and of the limestone formation, and which, as regards the southern portion of it, contains the fine caves which have been to a small extent opened to tourists.

The actual range of Tuart country has been estimated at about 500 square miles.

Bentham quotes :—

"Towards Cape Leeuwin, *Gregory*, Geographe Bay, *Leschenault*, Vasse River, *Oldfield*, Swan River, *Oldfield*, *Harvey*, and doubtfully, Murchison River, *Oldfield*."

Mueller, however, quotes Oldfield as having got it north of the Arrowsmith River, and he was a very careful collector. So that its range is from the Arrowsmith River to the Leeuwin, but chiefly in the vicinity of Geographe Bay ; it is not found at a great distance from the sea.

AFFINITIES.

Bentham places it in a section which includes *E. goniocalyx*, *E. incrassata* and *grossa*, and more particularly *E. vernicosa*, *E. megacarpa* and *E. Preissiana*.

I will take cognizance of these species.

1. With *E. marginata* Sm.

Mueller, while pointing out that it is one of the most marked of species, adds, "habitually not altogether dissimilar from *E. marginata*," a comparison I do not understand.

2. With *E. megacarpa* F.v.M.

"It might systematically be compared to *E. megacarpa* if the broadness and bluntness of the lid were kept out of view ; still the roughness of the bark, the thicker consistence of the leaves, the heterogeneous stomates, the stamens mostly straight in bud, the narrow anthers, the fruits longer than broad, with perhaps never more than four valves, already offer marks for easy distinction." (Mueller, "Eucalyptographia")

Bentham indicated the affinity at an earlier date.

Compare Plate 78, Part xviii, with Plate 92. The affinities of the two species are undoubtedly great. The stamens are different, the fruits of *E. gomphocephala* are more cylindroid and less domed, the bark more fibrous.

4. With *E. Preissiana* Schauer.

E. Preissiana is a small shrub with yellow filaments.

If Plate 78 be referred to, it will be seen that the shape of the fruits of the two species is not dissimilar, although those of *E. Preissiana* are larger and have more valves. The buds of the two species and size and appearance approximate to each other.

5. With *E. goniocalyx* F.v.M. (Doubtless *E. elæophora* F.v.M. is meant.)

In this connection Plates 82 and 83, Part xix, may be referred to. There is some resemblance in the largest buds and fruits (2*a* and 2*b*, Plate 83), but the rims of the two species are different. In *E. elæophora* the length of the operculum is always shorter in comparison with the calyx-tube. The fruits of both species are often angled, indeed many species are also angled. In bark and timber there is some resemblance; in juvenile foliage little.

6. With *E. grossa* F.v.M.

For figures of *E. grossa* see Fig. 2, Plate 18, and Fig. 1, Plate 72. It is only a small shrub; the affinity of the anthers is not close, nor is the resemblance of the fruits. The foliage is coarser than that of *E. gomphocephala*. *E. grossa* belongs to the *E. incrassata* group.

7. With *E. incrassata* Labill.

The forms comprised under *E. incrassata* are shrubs varying in size; *E. gomphocephala* is always a large tree. The form in Bentham's mind was doubtless that of var. *angulosa*, depicted in Plate 14 (Part IV). The resemblances between the two species seem to be of a very general character.

8. With *E. vernicosa*.

This is a dwarf, small, varnished-leaved species from mountain tops in Tasmania, with no close affinity to *E. gomphocephala*.

Explanation of Plates 89-92.

PLATE 89.

E. cinerea F.v.M.

1*a*. Mature leaves (orbicular); 1*b*, mature leaves and buds (from the same twig as 1*a*); 1*c*, anthers; 1*d*, fruit, Limekilns, near Wattle Flat, about 20 miles north of Bathurst. (R. H. Cambage and J.H.M.)
2. Juvenile leaves, Yass to Bowning. (R. H. Cambage.)
3. Mature leaves (lanceolate) and buds, Yass district. (G. H. Sheaffe.)
4. Mature leaf (lanceolate) with fruits, Yass. (R. H. Cambage.)
5. Mature leaves (cordate) with fruits, Barber's Creek, near Marulan. (J.H.M.)
6. Intermediate leaf, Marulan. (J. L. Boorman.)

Variety *multiflora*, new variety.

7. Juvenile leaf, Dandenong Mountain, Victoria. (J.H.M.)
8*a*. Broad mature leaf with buds; 8*b*, narrow mature leaf with buds; 8*c*, fruits; 8*d*, front and back view of anther, Victoria. (A. W. Howitt.)
9. Fruits, Ringwood, Victoria. (R. H. Cambage.)
10. Stalked fruits, near Castlemaine, Victoria. (J. Blackburne.)

PLATE 90.

Variety *multiflora*, new variety (*continued*).

1. Orbicular mature leaves with buds, Buchan, Victoria. (G. H. King.)
2*a*. Leaf of intermediate width, with buds; 2*b*, fruits, between Narrabarba, N.S.W., and the Victorian border. (J. S. Allan.)

Variety *nova-anglica*, new variety.

3*a*. Juvenile leaves; 3*b* and 3*c*, intermediate leaves; 3*d*, buds with pointed operculum; 3*e*, mature leaf with buds; 3*f*, buds with nearly hemispherical operculum; 3*g*, 3*h*, fruits; 3*i*, anthers; all from the type specimen, Moona Plains, Walcha, N.S.W. (A. R. Crawford.)
4*a*. Narrow leaf; 4*b*, small fruits; Timbarra, New England. (Charles Stuart.)

Eucalyptus pulverulenta Sims.

5. Juvenile foliage from a plant in the Botanic Gardens, Sydney, raised from seed obtained from Mt. Blaxland, N.S.W.
6*a*, 6*b*. Mature leaves from a drawing by Miss M. Smith of a specimen in the Kew Herbarium, labelled "Eucalyptus pulvigera, C., Rocky Hills, Cox's River, E. pulverulenta Sims." This is a type specimen of *E. pulvigera*, and was collected by Allan Cunningham at Mt. Blaxland.

PLATE 91.

Eucalyptus pulverulenta Sims (*continued*).

1*a*. Twig in bud and flower; 1*b*, anthers; 1*c*, fruits from Mt. Blaxland, Cox's River, N.S.W., locality of the type of *E. pulvigera*. (R. H. Cambage and J.H.M.)
2. Small fruits from 20 miles north-east of Cooma, N.S.W. (R. H. Cambage.)

Eucalyptus cosmophylla F.v.M.

3*a*. Juvenile leaf; 3*b*, intermediate leaf; 3*c*, mature leaf; 3*d*, buds; 3*e*, anthers, showing angles on the calyx-tube, Kuitpo Forest, Willunga, South Australia. (W. Gill)
4. Buds, with marked angles, Mt. Lofty, South Australia. (C. Walter.)
5. Buds, Bridgewater, South Australia (J. M. Black). These have more pointed opercula, and probably constitute the weak varieties *rostrigera* and *leprosula* of Mueller.
6*a*. Thick, markedly tri-nerved leaf; 6*b*, immature fruits (five in the head), Mt. Lofty, Adelaide. (W. Gill.)
7. Very large fruits, Harriet River, Kangaroo Island. (Dr. and Mrs. F. E. Rogers.)
8*a*. Fruits of medium size; 8*b*, small buds, showing the falling of a double operculum, Norwood, South Australia. (J. M. Black.)
9. Fruits, Aldgate, South Australia. (R. H. Cambage and J.H.M.)

PLATE 92.

Eucalyptus gomphocephala DC.

1*a*. Mature leaf; 1*b*, twig showing flattened glandular peduncle and buds from drawing of the type in A. P. de Candolle's "Mémoire sur la Famille des Myrtacées," Plate 11.
2*a*. Juvenile leaf; 2*b*, intermediate leaf; 2*c*, mature leaf; 2*d*, very young buds, with strap-shaped peduncle; 2*e*, anthers; 2*f*, fruits, Claremont, near Perth, W.A. (Dr. F. Stoward).
3*a*. Buds and flowers; 3*b*, fruits; 3*c*, very large fruits; Claremont (Dr. J. B. Cleland).
4. Buds on very long peduncle, Capel, W.A. (W. Donovan).

EUCALYPTUS CINEREA, F.v.M. (*1–6*).

EUCALYPTUS CINEREA, *variety multiflora*, MAIDEN (*7–10*). [See also Plate 90.]

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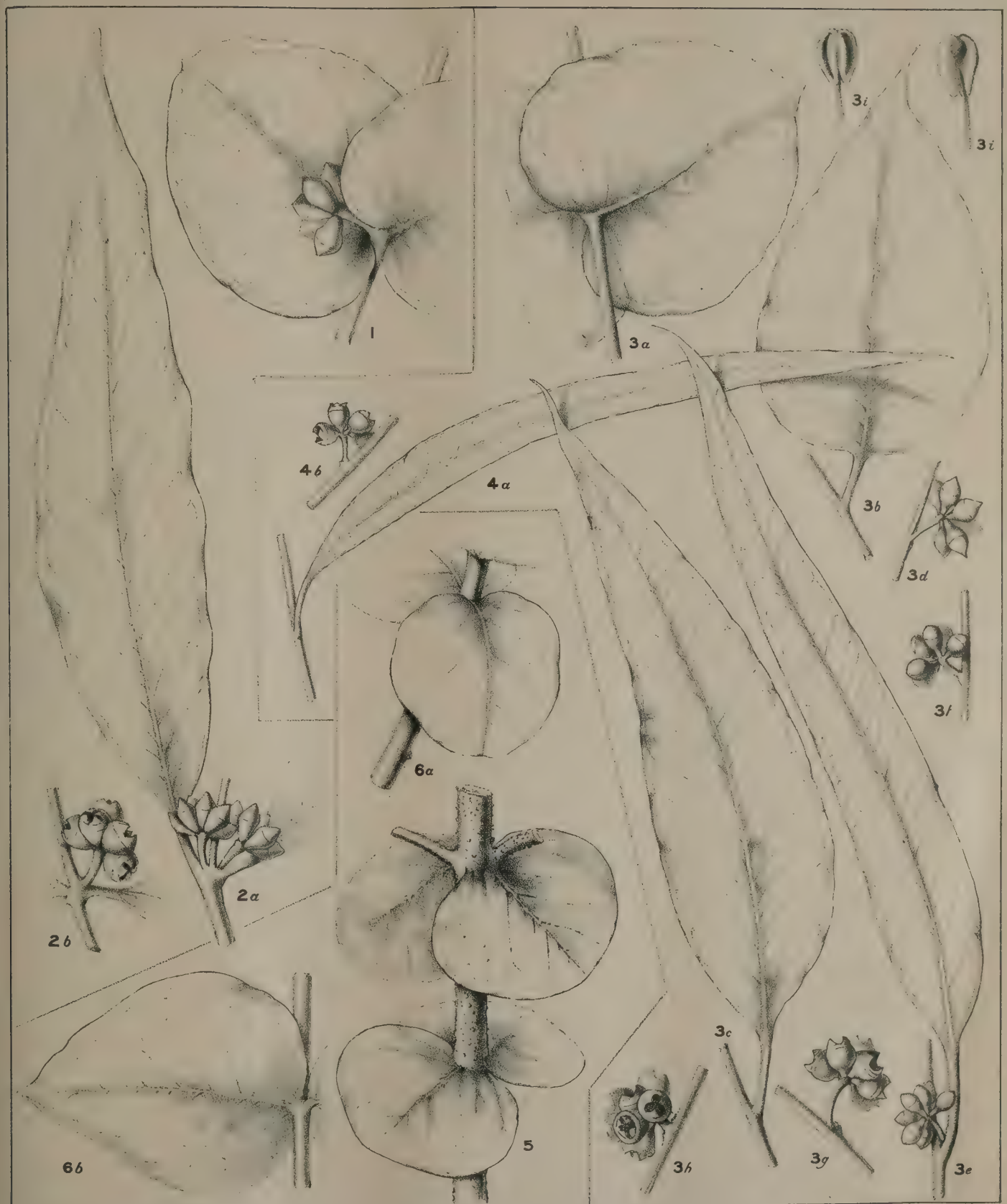

EUCALYPTUS CINEREA, F.v.M., *variety multiflora*, MAIDEN (*1–2*). [See also Plate 89.]

EUCALYPTUS CINEREA, *variety nova-anglica*, MAIDEN (*3–4*).

EUCALYPTUS PULVIGERA, A. CUNN. (*5–6*). [See also Plate 91.]

EUCALYPTUS PULVIGERA, A. CUNN. (*1–2*). [See also Plate 90.]

EUCALYPTUS COSMOPHYLLA, F.v.M. (*3–9*).

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EUCALYPTUS GOMPHOCEPHALA, DC.

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The following species of Eucalyptus are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets:—

acacioides, A. Cunn. (xlviii)
acmenioides, Schauer (xxxii).
amygdalina, Labill. (xvi).
Andrewsi, Maiden (xxi).
Baileyana, F.v.M. (xxxv).
Behriana, F.v.M. (xlvi).
bicolor, A. Cunn. (xliv).
Boormani, Deane and Maiden (xlv).
Bosistoana, F.v.M. (xliii).
capitellata, Sm. (xxviii).
Consideniana, Maiden (xxxvi).
coriacea, A. Cunn. (xv).
corymbosa, Sm. (xii).
dives, Schauer (xix).
fruticetorum, F.v.M. (xlii).
gigantea, Hook. f. (li).
goniocalyx, F.v.M. (v).
hæmastoma, Sm. (xxxvii).
hemiphloia, F.v.M. (vi).
longifolia, Link and Otto (ii).
Luehmanniana, F.v.M. (xxvi).
macrorrhyncha, F.v.M. (xxvii).
maculata, Hook. (vii).
melliodora, A. Cunn. (ix).
microcorys, F.v.M. (xxxviii).
numerosa, Maiden (xvii).
obliqua, L'Hérit. (xxii).
ochrophloia, F.v.M. (l).
odorata, Behr and Schlechtendal (xli).
paniculata, Sm. (viii).
pilularis, Sm. (xxxi).
piperita, Sm. (xxxiii).
Planchoniana, F.v.M. (xxiv).
populifolia, Hook. (xlvii).
punctata, DC. (x).
regnans, F.v.M. (xviii).
resinifera, Sm. (iii).
saligna, Sm. (iv).
siderophloia, Benth. (xxxix).
sideroxylon, A. Cunn. (xiii).
Sieberiana, F.v.M. (xxxiv).
stellulata, Sieb. (xiv).
tereticornis, Sm. (xi).
virgata, Sieb. (xxv).
vitrea, R. T. Baker (xxiii).

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A Critical Revision of the genus Eucalyptus

BY

J. H. MAIDEN

(Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney).

Vol. III. Part 2.

Part XXII of the Complete Work.

(WITH FOUR PLATES.)

"Ages are spent in collecting materials, ages more in separating and combining them. Even when a system has been formed, there is still something to add, to alter, or to reject. Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages. In these pursuits, therefore, the first speculators lie under great disadvantages, and, even when they fail, are entitled to praise."

MACAULAY'S "ESSAY ON MILTON."

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DESCRIPTION.

CXVII. E. erythronema Turczaninow.

In *Bull. Phys.-Math. Acad. Pétersburgh*, 10, 337 (1852).

FOLLOWING is the original description :—

(Drum. 5, n. 37).

E. glabra; ramis teretibus; foliis alternis lineari-lanceolatis utrinque attenuatis inæquilateris opacis obscure trinerviis venosisque; umbellis lateralibus 2–3–, rarius 4–floris; pedunculis deflexis teretibus petiolo duplo longioribus, pedicellis petiolum aequantibus versus apicem incrassatis costatis, cupula obconica multisulca plus duplo longioribus; operculo conico lævi cupulam plus quam duplo excedente. Folia limbo 1½–2 poll. longo, 3 lin. in parte latiore lato, impunctata. Operculum interdum apice subincurvum. Filamenta miniata, cupula duplo longiora. Capsula inclusa, vertice plana, 4 locularis.

The type is therefore Drummond's 5th collection, No. 37.

It was redescribed by Bentham as *E. conoidea* Benth.,* in English of course, in B.Fl. iii, 227, and figured in the "Eucalyptographia."

It has scarlet filaments, and the flowers are borne in great profusion; consequently this species is one of the most ornamental for horticultural purposes. It comes from a region of comparatively low rainfall (say 10 inches per annum), but it will accommodate itself, under cultivation, to regions of far higher rainfall.

SYNONYM.

E. conoidea Benth. in B.Fl. iii, 227.

Varieties.

1. Var. *marginata* Benth.
2. Var. (?) *Roei* Maiden.

1. "Border of the calyx expanded into a prominent horizontal or reflexed ring." Drummond, iii, 56 (B.Fl. iii, 227).

I have not seen Drummond's No. 56 of the 3rd Collection, but I would suggest that Fig. 3, Plate 93, comes near it, and that the character given does not constitute a useful variety.

2. Var. (?) *Roei* Maiden.

See *Eucalyptus erythronema* Turcz. var. *Roei* Maiden in litt. (*E. Roei* Beck. mss. in herb. Vindobon. ex Maiden).

Hab. in distr. Coolgardie pr. Gilmores in fruticetis apertis lutosis glareoso-lapidosis fr. m. Nov. (D. 5831). (Diels and Pritzel in *Engler's Bot. Jahrb.* 1904, p. 439.)

* A number of Turczaninow's descriptions were overlooked by Bentham, and hence found no place in the *Flora Australiensis*.

See also my note in Part IV, p. 110, of the present work in which occurs the passage:—

There is a form of this species which I have termed var. *Roei*.

1. (*E. Roei* Beck, in Herb. Vindob., inter Swan River and King George's Sound, Roe (Hügel), (Herb. Vindob.).

2. (This is Diels' and Pritzel's specimen referred to above.)

I add the note that var. *Roei* "has fruits which might readily be confused with those of the typical form of *E. incrassata*."

This supposed variety is based, as Diels and Pritzel state, on a specimen (or specimens) in the Vienna herbarium. Mounted on one sheet and with one label, we have (*a*) a twig bearing leaves and immature buds; (*b*) a twig with ripe fruits; (*c*) a twig with nearly ripe buds.

I matched with these Diels' No. 5,831 and a specimen in fruit from F. H. Vachell, Kellerberrin, W.A. On further consideration, I have come to the conclusion that the specimens mounted on the Vienna sheet are mixed, the ripe buds (*c*) belonging to *E. erythronema*, while (*a*) and (*b*) belong to another species. I looked upon the specimens as representing an abnormal fruiting variety of *E. erythronema*.

As a clear statement of the case involves comparison with *E. occidentalis* and its varieties, I have thought it best at this place to express doubt as to whether var. (?) *Roei* is a form of *E. erythronema* at all, and to say that a statement as to its position will be offered when *E. occidentalis* is dealt with.

RANGE.

It is confined to Western Australia, and Mueller gives the following localities:—

"Towards the remotest eastern sources of the Swan River, and also near Mount Lindsay." (Th. Muir). (Mount Lindsay is a few miles north of Denmark, which is about 34 miles west of Albany.)

To which I may add the following localities of specimens represented in the National Herbarium, Sydney:—

Cowcowing. "A small tree of 20–30 feet, with a very light gray, smooth bark; grows on light soil." (Max Koch, No. 1,042.)

Avon district. (E. Pritzel, No. 998.)

Tammin. Tree. 4–5 metres. (L. Diels, No. 2,853.)

Kellerberrin. "Not exceeding 15 ft. Pure white, smooth, shiny bark. In some cases the colour of the trunk and branches is whity-pink. Flowers gorgeous." (F. H. Vachell.)

Southern Cross. (Mrs. Heal in Herb. Melb.)

AFFINITIES.

Bentham, B.Fl. iii, 193, places it in a subsection with *E. pyriformis*, *longifolia*, *urnigera*, and *cæsia*, contrasting it with *E. longifolia*.

He also points out that *E. decurva*, *E. doratoxylon*, and a few others have loose reflexed umbels. (See the figures of the umbels of buds of *E. leucoxylon*, Fig. 13*a*, Plate 55; *E. decurva*, Fig. 1*c*, Plate 70; and *E. doratoxylon*, Fig. 4*d*, Plate 70, of the present work.)

Mueller contents himself with, "The leaves remind one of those of *E. amygdalina*, though they are smaller; the lid is much like that of *E. tereticornis*; the fruit is not very similar to that of any other congener." I do not think that comparisons with these two species can be usefully considered.

Nor am I impressed with the affinities suggested by Bentham in the first paragraph. *E. erythronema* has a good deal of individuality, and at present I am inclined to look for its close relations amongst the Cornutæ. I will return to the subject when that group of plants is being dealt with.

DESCRIPTION.

CXVIII. E. acaciæformis Deane and Maiden.

In *Proc. Linn. Soc. N.S.W.*, xxiv, 454, with Plate xxxvii (1899).

A LARGE, rather umbrageous tree, attaining several feet in trunk diameter (Mr. A. R. Crawford says "over 6 feet").

Vernacular Names.—This is recognised as a "Peppermint" in New England, and sometimes, by way of distinction, "Black," or "Narrow-leaved Peppermint." The term "Black" is in allusion to the dark colour of the bark as compared with that of *E. Stuartiana.*

Bark.—Sub-fibrous, resembling that of *E. piperita* a good deal.

"Sometimes very rough and furrowed, almost like an Ironbark."—(A. R. Crawford, *in litt.*).

Timber.—Pale reddish.

Seedling Leaves.—Narrower than the suckers, but otherwise very similar. They are strictly opposite.

Sucker Leaves.—Pale coloured, lanceolate, symmetrical, always blunt at the apex, which is somewhat rounded. The margin is crenulate, a very unusual circumstance in a Eucalypt; and the leaves are alternate, and not opposite as is the case of normal *Stuartiana.* The average size of the young leaves is $1\frac{3}{4} \times \frac{5}{8}$ inch.

Mature Leaves.—Lanceolate, the average size of the leaves being $2\frac{3}{4} \times \frac{1}{2}$ inch. The foliage is not glaucous in any part, not even the sucker foliage. Margins often crenulate. Equally green on both sides. The intramarginal vein distinctly removed from the edge; the transverse veins fine, nearly parallel, and at about an angle of 45 degrees with the midrib.

Buds.—Commonly up to 6 or 7 in the head; stalklets short and angular; stalks usually four or five lines long, very angular or flattened. Operculum a little pointed; about equal in size to the calyx style short and the stigma dilated somewhat. The anthers opening in parallel slits.

Fruit.—Small, with short stalklets; the stalks of about twice the length, roundish, being only slightly compressed. The valves scarcely exserted, and usually only three. Shape of fruit rather more cylindrical than hemispherical, $\frac{3}{16}$ inch broad x $\frac{7}{32}$ inch long. Rim of medium width and nearly horizontal.

A correspondent (Mr. E. H. F. Swain) states that the inner bark has a distinct odour of turpentine, and hence the tree is sometimes known as Turpentine.

RANGE.

It is confined to the New England district, New South Wales, so far as is known at present.

I wrote as follows in regard to my first experience with this tree:—

Between Yarrowitch and Tia I got off my horse to examine what appeared to me to be an *Acacia* of the *penninervis* group. When I got close to it I found that it was the young foliage of a Eucalypt. The plant is a beautiful species in a young state, forming a dense shapely shrub, say 6 or 8 feet in diameter, and different to any other Eucalypt known to me. The young, or sucker foliage, is pale coloured lanceolate, symmetrical, always blunt at the apex, which is sometimes rounded. The margin is crenulate

a very unusual circumstance in a Eucalypt, and the leaves are alternate, and not opposite as in the case of normal *Stuartiana*. The average size of the young leaves is $1\frac{3}{4}$ x $\frac{5}{8}$ inch. Turning to the mature foliage, it is lanceolate, the average size of the leaves being $2\frac{1}{4}$ x $\frac{1}{2}$ inch. The foliage is not glaucous in any part, not even the sucker foliage. The tree attains a size of 2 or 3 feet in diameter. I traced it from 5 miles east of Yarrowitch to at least as far west as Tia. Mr. A. R. Crawford has sent it to me from Moona Plains, in the Walcha district. Mr. Henry Deane has collected it near Glen Innes. (*Proc. Aust. Ass. Adv. Science*, vii, 542, 1898.)

Speaking of New England, Mr. J. F. Campbell writes, this is the "Scrub or narrow-leaved Peppermint," confined chiefly to the plateau scrubs of the higher altitudes, country generally of cold soils and difficult to improve.

A specimen from the Dividing Range towards the Gloucester, *Leichhardt*, with the same foliage, with young buds like those of *E. crebra*, but with very small globular-truncate fruits, scarcely contracted at the orifice (B.Fl. iii, 222, under *E. crebra*), seems to me to be *E. acaciæformis*.

The following are additional localities in the National Herbarium, Sydney:—

Guy Fawkes (J. L. Boorman); Baker's Creek to Chandler River, Armidale district (A. W. Howitt); Parish of Scott, County of Parry (E. H. F. Swain); "Black Peppermint," Parish Vernon, County Perry (M. H. Simon); Foot of Mount Spiraby, 2 miles east, Tenterfield district (J.H.M.); Boonoo Boonoo, 12 miles north-east of Tenterfield (R. H. Cambage).

AFFINITIES.

E. acaciæformis has no very close affinities so far as we know at present, so that further enquiry is necessary.

1. With *E. cinerea* F.v.M. var. *nova-anglica* Maiden (*E. nova-anglica*, Deane and Maiden).

The bark and timber are similar; I cannot indicate any important difference between them. The two trees grow together. Compare Plate 90 (Part xxi). The juvenile leaves sharply separate them.

2. With *E. parvifolia* Cambage.

There is some resemblance to this species. I will refer to the matter when I figure *E. parvifolia*. *E. acaciæformis* has a rough bark, while that of *E. parvifolia* is smooth.

Variety.

Variety *linearis*, Deane and Maiden (*loc. cit.*).

The Eucalypt referred to as No. 4 at p. 542, Vol. vii, *Proc. Aust. Ass. Adv. Science* (1898).

A singularly graceful tree, reminding one of a Weeping Willow. Height about 50 feet, and trunk diameter 2 feet, as far as seen.

The twigs are slender, a characteristic of the tree being the smallness and the grace of its parts.

Vernacular Names.—A "Peppermint," or "Narrow-leaved Peppermint." "Grey Peppermint" (H. Deane).

Bark and Timber similar to normal form.

Juvenile Foliage.—Has crenulated margins like the normal form, but longer, narrower, and more pointed leaves. Some of the very young foliage is linear-lanceolate, and even linear.

A good deal of the young foliage reminds one superficially of that of the Wilga (*Geijera parviflora*).

Alternate, not opposite like *E. Stuartiana*.

Mature Foliage.—Linear-lanceolate or lanceolate, the average dimensions being, say, 5 x $\frac{3}{8}$ inch.

Fruits.—Smaller than those of the normal form, reminding one of those of *E. microtheca*, but the calyx less hemispherical. Valves well exserted. Pedicels, on the average, as long as the fruits; the common peduncle also much longer than that of the normal form.

RANGE.

New England, New South Wales.—I have personally collected it from Yarrowitch to Walcha, and Mr. Henry Deane near Glen Innes. It also occurs in the Armidale district. On slate formation at Enmore, head waters of Macleay River, 18 miles east of Uralla (R. H. Cambage, No. 3,780). Swamp Oak (E. H. F. Swain), but specimens not perfect, and therefore a little doubtful.

DESCRIPTION.

CXIX. E. pallidifolia F.v.M.

In *Fragmenta* iii, 131 (1863).

The original is of course in Latin, and a description in English will be found in B.Fl. iii, 236.

Mueller did not figure it in "Eucalyptographia," and it is now figured for the first time. Perhaps this will lead to more general recognition of it and publication of further data, a species concerning which more information is desirable.

It is a crooked tree whose bark is white to the ground and brittle. (R. H. Cambage). It is therefore a White Gum.

F. M. Bailey says of a specimen that "the wood of this small tree is yellow near the bark, the rest red, hard, close-grained, and prettily mottled."

Mr. W. W. Froggatt tells me that the punctures forming galls on the leaves are caused by some small chalcid wasp. *E. Preissiana* is another species which has insect markings on the leaves. See Fig. 4*a*, Plate 77.

Speaking generally, the foliage may be described as yellowish green and dull.

The juvenile leaves (received too late from Mr. Cambage for figuring) have not previously been described, and are nearly orbicular to broadly lanceolate, rhomboid or oblong with angular branchlets, petiolate, tough, equally pale-green on both sides, fine intramarginal vein distinct from the edge. The anther may be described as of medium size, opening in parallel slits; filament attached about the middle; gland near the top at the back.

The plate was drawn some months before Mr. Cambage's specimens were received, and it is to be noted that the fruits of his specimens are uniformly much smaller than those drawn.

RANGE.

The type comes from the Sandstone Tableland, Upper Victoria River and Sturt's Creek (also in the vicinity of the Upper Victoria River), Northern Territory. Near the head of Kilgour River, Northern Territory, in ranges (G. F. Hill, No. 5,560).

The species extends into Northern Queensland.

Very little was known by me about this species until, in Mr. R. H. Cambage's recent trip to Northern Queensland, he observed this tree and brought back excellent specimens. The following were collected by him:—

(1) It occurs near Boomarra, about 100 miles north of Cloncurry, also between Quamby and Granada, on cretaceous elevated sandstone formations, and again just to the east of Cloncurry on Silurian slate ridges.

(2) In bud and flower, Cowan Downs, Cloncurry River, 120 miles south of Normanton. (No. 3,945).

(3) "Mountain White Gum." Donor's Hills, Flinders River, 100 miles south of Normanton. (No. 3,942).

(4) Stunted white gum trees, smooth bark, timber red. Gravelly ironstone and sandy ridge, near Donor's Hills, about 85 miles south of Normanton.

AFFINITIES.

1. With *E. oleosa* F.v.M. Mueller suggests the affinity, and Bentham, in referring to it, says: "The venation of the leaves and the fruit are very different."

For the purposes of comparison, reference may be made to Plates 65 and 66 of the present work. Certainly some of the mature leaves of *E. pallidifolia* resemble some leaves of *E. oleosa*, but the resemblance is exceptional. The shape of the buds is sometimes similar (*e.g.*, Fig. 4h, Plate 65), but again the resemblance is exceptional, for the operculum of *E. oleosa* is pointed. There is but slight resemblance in the fruits, while the anthers are very different.

Mr. Cambage remarks that when seen growing in the forest the two species bear no resemblance to one another.

2. With *E. alba* Reinw.

E. pallidifolia F.v.M. bears a resemblance in juvenile foliage to that of the above species, though that of *E. alba* is usually much larger, and the adult leaves of the two species are different enough. The buds and fruits, though smaller in *E. pallidifolia*, bear a general resemblance to those of *E. alba*. The anthers of the two species are not very dissimilar; that of *E. pallidifolia* is a little the shorter.

3. With *E. populifolia* Hook.

The young foliage of this species bears a certain resemblance to that of *E. pallidifolia*, but the mature foliage of the two species is very different. The anthers, also, are very different.

DESCRIPTION.

CXX. E. cæsia Benth.

In B.Fl. iii, 227 (1866), which need not be transcribed.

The type is Drummond's 5th Collection, Supplements No. 36.

It is not figured in the "Eucalyptographia." It is a tree of 20–30 feet.

Mueller and Tate, in describing the plants of the Elder Expedition, supplement our knowledge of this species in the following manner:—

Some of the leaves verge into a lanceolar-ovate form. Flowers (hitherto undescribed) when expanding, sometimes less than a quarter inch long; calyces just before opening measuring in total length from two-thirds to one inch; tube turbinate-semiovate, often dilated near its edge, somewhat striate; operculum about as long as the tube, hemispheric, suddenly terminating into a conspicuous narrow conic protraction; stamens inflected while in bud, all fertile; filaments rigidulous, dull-yellowish when dried, some attaining a length rather above half an inch; anthers pale, cuneate-ellipsoid, broader towards the base but pendent, bursting by longitudinal fissures; style prominent, but considerably shorter than the stamens; stigma hardly broader than the summit of the style. (*Proc. Roy. Soc. S.A.*, xvi, 358.)

The roots of this Eucalypt, termed "Gungurru," are eaten. (Helms, *op. cit.*, p. 325.)

RANGE.

The species is confined to Western Australia.

The type is stated to have come from the Murchison River.

Mueller records it from Victoria Desert (No. C. 63), 40 miles north-west from Fraser Range (R. Helms, Elder Expedition); also from Mount Stirling, and about 50 miles east from York (Hon. W. M. Parker). See *Proc. R. S., S.A.*, xvi, 358. The two last localities remove it from the desert to no great distance east of both York and Albany, and all three localities are a good deal distant from the Murchison.

AFFINITIES.

1. With *E. incrassata* Labill.

"The examination of the flowers now shows that this species should take its systematic place near *E. incrassata*" (Mueller and Tate *loc. cit.*). I have only seen Drummond's specimen of indubitable *cæsia*. Mueller's material may be my

E. Woodwardi Maiden; on the other hand, further knowledge and material may show that the two plants are conspecific. In p. 214, Part XVI, of this work, I have compared *E. Woodwardi* with *E. incrassata* Labill., var. *angulosa* Benth., the variety which appears to be closest to the present form.

2. With *E. Woodwardi* Maiden.

See p. 214 and Plate 72, Part XVI of the present work. The differences between the species seem to be as follows, so far as existing material renders a comparison safe.

E. cæsia Benth. Small leaf, $3\frac{1}{4}$ inches long; long, thin peduncle, about $1\frac{1}{8}$ inches; long pedicel to fruit; fruit large and inclined to be *urceolate*.

E. Woodwardi Maiden. Large leaf, 6 inches long; peduncle thick, $\frac{3}{4}$ inch and less in length; short pedicel to fruit, which is blackish in colour; fruit much smaller than that of *E. cæsia* and *widening* at the top; very glaucous, coarse twigs. The filaments of *E. Woodwardi* are orange-coloured; those of *E. cæsia* are unknown.

I have compared these two species *loc. cit.*, p. 214, using different words, and if ampler material be available the relations of *E. cæsia* can be re-examined.

DESCRIPTION.

CXXI. E. tetraptera, Turczaninow.

In *Bull. Soc. Nat. Moscow*, xxii, ii, 22 (1849).

FOLLOWING is the original description :—

E. tetraptera. Caule ramoso glabro, cinereo, ramis teretibus ramulisque tetragonis brunneis, foliis alternis petiolatis ovato lanceolatis, marginatis, opacis, obtuse, acuminatis, basi obtusiusculis vel parum attenuatis ; pedunculis solitariis unifloris recurvis, compresso-dilatis, cupula maxima tetraptera, plus quam duplo brevioribus ; pedicellis nullis operculo tetragono-pyramidato acuto, basi orificiem cupulae æquante, lateribusque pyramidis concavis. Alabastra cinnamomea, formæ singularis crassa, bipollicaria, circiter pollicem in diametro, pyramide 6 lin. longa. Drum. 4, n. 17.

It was subsequently described by Bentham in *B.Fl.* iii, 228, and later illustrated in the "Eucalyptographia" by Mueller, but the flowers and fruits are reduced in size in that work.

The conical operculum is less in diameter than the winged and reddish calyx-tube.

The anther is long, shaded purple in colour (which is unusual), with a gland at the top, and the crimson filament at the base.

SYNONYM.

E. acutangula Turcz.

The original description is given, as it is not easily accessible.

51. *E. acutangula.* (Drum. 5, n. 189.)

E. glabra ; ramis tetragono-alatis ; foliis alternis ovato lanceolatis, basi parum attenuatis, mucrone obtuso terminatis, trinerviis multiveniis lucidis crassis ; pedunculis axillaribus unifloris angulatis deflexo-pendulis, petiolo compresso-tetragono brevioribus ; cupula maxima (3½ poll. longa, 1½ poll. lata) pyramidata, tetragono-alata ; operculo depresso ad angulos elevato-dentato in umbonem pyramidatum tetragonum obtusiusculum producto, cupula plus quam triplo breviore. Folia 7½-8 poll. longa, 2½ poll. lata, petiolo pollicari. Ramus 6 lin. crassus. Nervus foliorum medius utrinque valde elevatus, laterales venæque multo tenuiores.

Nomen *E. pruinosæ*, propter homonymum Schauerianum antiquius, p. 339, in *E. macrocalycem* mutetur. Turcz. in *Bull. Phys.-Math. Acad. Peters.*, 10, 1852, p. 338.

RANGE.

It is confined to Western Australia. Bentham gives –

"Between Swan River and King George's Sound, *Drummond*, 4th Collection, No. 71 (? 17), (which is the type), and 5th Collection, No. 189 (which is the type of *E. acutangula* Turcz.) ; *Harvey* ; Fitzgerald River, and Granite Hills, north of Cape Le Grand (the east cape of Esperance Bay), *Maxwell*."

Mueller ('Eucalyptographia") adds Mount Rugged, which is a misprint for Ragged, a mountain about 50 miles north of Cape Arid. I have it from Bremer Bay (J. Wellstead, through Dr. A. Morrison); near Cape Riche (S. Dunn).

AFFINITIES.

Mueller makes no comparison of this species with any other, and it is very rarely that he omits to do this. Bentham places it next to *E. miniata* A. Cunn.

1. With *E. miniata* A. Cunn.

I do not think the resemblance is close. *E. miniata* is a large tree; *E. tetraptera* is a small shrub, and my readers who peruse this Part can note other differences, and few similarities will occur to most people.

2. With *E. Forrestiana* Diels.

This comparatively recently described species is its closest affinity, and I will refer to this aspect when I deal with the latter species.

DESCRIPTION.

CXXII. E. Forrestiana Diels.

In "Fragmenta Phytographiæ Australiæ occidentalis" in Engler's *Botan. Jahrbucher*, xxxv, 439 with Fig. 50 (1905).

The original, in Latin, may be translated as follows:—

A tall shrub, leaves alternate, subfalcate, lanceolate, somewhat thick, in the living state glaucous green, scarcely shining, midrib conspicuous, veins sunk; flowers large, solitary in the axil, with long peduncles; peduncle elongated, drooping, thickened towards the club-shaped apex, scarlet in colour; receptacle (i.e., calyx) nearly as long as the peduncle, obconical, quadrangular, scarlet, many times longer than the pyramid-shaped operculum; stamens yellow, inflexed in the bud, glandular: fruit quadrangular, ovoid truncate, with a raised rim; valves enclosed in the subquadrate calyx-tube.

A shrub 2–3 metres high; petiole 1·5–2 cm.; lamina 7–10 x 1·5–2·5 cm.; peduncle 4–5 cm. long; receptacle 4 x 1·5 cm.; fruit 4 x 2 cm.

Named in honour of Sir John Forrest, the celebrated explorer of Western Australia, and Premier of the State for ten years.

RANGE.

Found in the district of Coolgardie, especially in the south, from Esperance Bay, about 30 miles towards the north, in open scrub lands in muddy sandy country. It flowered November, 1901 (D. 5,332). I have a specimen (5–10 feet high), collected by Mr. Cecil Andrews, between Esperance and Norseman—the same general locality as the type.

AFFINITIES.

1. With *E. tetraptera* Turcz.

Dr. Diels says, "This very distinct species is closely related to none except to *E. tetraptera*, differing in its never divaricate habit, smaller subopaque leaves, elongated petiole, much narrower calyx-tube, in the much narrower wings of the calyx-tube and fruit."

2. With *E. incrassata* Labill.

I have a specimen of this species ("S. W. Australia," Maxwell, from Herb. Melb.), which shows undoubted resemblance to *E. Forrestiana*. Its fruit is almost as large, but it has the multi-ribbing of the var. *angulosa* of *E. incrassata* and not the quadrangulate ribbing which amounts to wings in *E. Forrestiana*. Such marked

quadrangularity is often associated with a bunching of the filaments as seen in the Eudesmieæ. The long peduncles of *E. Forrestiana* are not found in *E. incrassata*, but the foliage of the two species is somewhat similar. The anthers of the two species are very different.

3. With *E. ptychocarpa* F.v.M.

The fruits of the two species have some resemblance, and I will deal with the matter when I come to *E. ptychocarpa*.

Other species with glandular filaments are *E. leucoxylon*, F.v.M. (see Fig. 1, Plate 56), and *E. megacarpa*, F.v.M. (see Fig. 6, Plate 78). There does not appear to be any other marked similarity between *E. Forrestiana* and these species.

DESCRIPTION.

CXXIII. E. miniata A. Cunn.

Ex Schauer in Walpers' Repertorium ii, 925 (1843).

THEN described in B.Fl. iii, 228, and subsequently described and figured by Mueller in the "Eucalyptographia."

It may attain the dignity of a tall tree, and the late Mr. N. Holtze of Darwin informed me that the white ants (Termites) eat the heart-wood, but do not touch the sap-wood. The timber is reddish brown according to Mr. R. H. Cambage.

The juvenile leaves (collected by Mr. R. H. Cambage at Croydon, North Queensland, but received too late for figuring) have not hitherto been described. They are petiolate, and cordate to broadly lanceolate, not acuminate, but often with a short mucro; sometimes emarginate. Intramarginal vein at a considerable distance from the edge; secondary veins pinnate. The rhachises and both sides of the leaves, particularly the under sides, plentifully besprinkled with stellate hairs.

The bark is remarkable, and appears to very closely resemble only that of *E. phœnicea*. The original describer does not refer to it, but Leichhardt refers to it as a "Stringybark," as "lamellar (the branches white and smooth)." Mr. R. H. Cambage speaks of it as "yellow, scaly, almost papery." That gentleman has presented me with a piece of a branch or small sapling, with bark thereon, and I can only add that no Eucalyptus bark I have ever seen reminds me so much of the more friable barks of various species of Birch (*Betula*) in its colour—white to yellow and reddish brown—and uniform papery thinness, and differs only in its brittleness. It is, indeed, so brittle that it will break into thin small foliaceous pieces and blow away if it is not kept carefully wrapped up in paper or cloth.

It can be readily understood that the bark on the trunk (the tree reaches a diameter of 2 feet) is more coarsely lamellar, rendering the names "Woollybutt" and even "Stringybark" more or less appropriate.

We can now understand Mueller's description of the bark in the "Eucalyptographia". . . "lamellar, brittle, partly glittering, interwoven with woody ramifications, grey-brownish or yellowish outside.". . . a free translation of his description of the bark of *E. aurantiaca* (a synonym of *E. miniata*), in *Journ. Linn. Soc.*, iii, 91.

Mueller, *op. cit.*, p. 99, in his cortical system, created a special group, "Lepidophloiæ—cortex saltem in trunco persistens lamellaris friabilis. (Vulgo, Melaleuca gum trees, Mica trees.)" The only species with such barks are *E. miniata*

and *E. phœnicea.* The term "Melaleuca gum-tree" was coined by Leichhardt, as will be seen presently, and refers to the papery bark; the term Mica-bark is a little more fanciful, and was originated by Mueller.

The glory of this tree consists in the gorgeousness of the flowers, which vary from orange to nearly scarlet in colour.

It possesses a large anther, opening in parallel slits close to where the anther cells meet. Opens widely from the outer side; is curved back by the two cells not separating in the middle. Gland at the back. Filament attached at the middle. Versatile. This appears to be a unique anther; *E. phœnicea* has a similar one but rather smaller.

SYNONYM.

E. aurantiaca F.v.M., in *Journ. Linn. Soc.*, iii, 91 (1859). The type came from the Gulf of Carpentaria.

RANGE.

This is a tropical species, and the type comes from craggy declivities near York Sound (North West Australia).

Bentham gives the following localities:—Hunter's River, York Sound (the river flows into York Sound from the north); and Greville Island, North West Australia, *A. Cunningham*; islands of the Gulf of Carpentaria, *R. Brown*; sandy plains and rocky table-lands round the Gulf of Carpentaria, *F. Mueller*; between the Lynd River and Port Essington, *Leichhardt.*

Mueller adds "Palmer River, North Queensland (*T. Gulliver*)," and gives the range collectively as "around the Gulf of Carpentaria to Arnhem's Land, reaching the Victoria River (*Mueller*) and Port Darwin (*Schultz*)."

It is in the National Herbarium, Sydney, from the following localities:—

North West Australia, Greville Island (A. Cunningham), a co-type. Summit of Mt. Rason (King Leopold Range), Table-top Mountain (Artesian Range), Goody Goody (W. V. Fitzgerald).

Mr. Fitzgerald, in a newspaper, says that it "occurs near Derby, but it is much more abundant north-east of the King Leopold Ranges, where it forms a not inconsiderable constituent of the forest vegetation; covering the sandstone and quartzite ranges and foot-hills." He calls it "Woolly-butt." Derby is on King

Sound, and the King Leopold Ranges lie between King Sound and York Sound (to the north), so that these localities are in the same district as that from which the type came.

In his Report on Portions of the Kimberleys (1905-6), published in 1907, he refers to this species as restricted to the sandstone and quartzite ranges, table-lands and sandy foot-hills, and states that with its masses of orange-scarlet flowers and mealy white inflorescence it is quite a feature in the landscape. It grows in the poorest of soils, and often flowers as a shrub of only a few feet in height.

Northern Territory.—It is the "Bloodwood" of the Northern Territory, according to Professor Baldwin Spencer and others, though Mr. W. S. Campbell calls it "Woolly Butt," as appears to be the more general name in North Western Australia. The appearance of the bark approximates more to those of the Bloodwoods of Eastern Australia.

It is the "Melaleuca Gum" of Leichhardt in his "Overland Expedition from Moreton Bay to Port Essington, *e.g.*, pages 263, 410, 470, 471, 474, 475, 480, 535. In the map accompanying this work (see May 16 and 17), when on the Upper Lynd, opposite Rockingham Bay, he uses the name "Orange-blossom Stringybark," in reference to the colour of the flowers, but the bark he refers to as "lamellar."

Following are the principal references to the "Melaleuca Gum" in the above-quoted work:—

> . . . a Eucalyptus, with very scanty foliage, orange-coloured blossoms, seed-vessels longitudinally ribbed, and as large as the egg of a fowl; its butt was covered with a lamellar bark, but the upper part and the branches were white and smooth (p. 263).
>
> Here we again observed the gum-tree with orange blossoms and large ribbed seed-vessels, which we found at the Upper Lynd, and had called Melaleuca Gum (p. 410).

He was now off the south coast of the Gulf of Carpentaria, opposite the Sir Edward Pellew Islands.

Leichhardt collected it "from the Upper Lynd to Port Essington," and called it "The Melaleuca Gum-tree with very large seed-vessels, ... fine orange blossoms, big seed-vessels, $1\frac{1}{2}$ inches long, 1 inch broad." The above is a copy of a herbarium label in Leichhardt's handwriting from the Paris Herbarium.

In the National Herbarium, Sydney, we have it from Darwin (N. Holtze); "Bloodwood," Hell Gate, Roper River, common, Darwin to Roper River (Baldwin Spencer); "Woolly Butt," "The universal Eucalypt of the Territory" (W. S. Campbell); Pine Creek Railway (E. J. Dunn); Gulf of Carpentaria (R. Brown, 1800-5); 8-mile Spring on to Tanumbirini (near creeks and springs). "Stem like Bloodwood. Appears to be same species as White Flowering Gum" (G. F. Hill, No. 809).

Northern Queensland.—Walsh River (T. Barclay-Millar); Croydon (James Gill).

It also occurs on the Lynd River, as already described.

Yellow scaly bark on trunk, almost papery. Branches clean. Leaves pale green to yellowish. About 50 feet high. On granite, Almaden (R. H. Cambage, No. 4,007).

Little River, between Gilbert River and Croydon (R. H. Cambage, No. 4,008).

AFFINITIES.

1. With *E. phœnicea* F.v.M.

This will be dealt with when *E. phœnicea* is reached. See p. 42.

2. With *E. ptychocarpa*.

In its fruit *E. miniata* resembles *E. ptychocarpa* very much, but the bark of the latter is more stringy, more solid, and on the main branches persistent, its leaves are of darker colour above, of larger size and thicker substance, still less perceptibly dotted by oil-pores, more copiously and more prominently veined, and devoid of stomata on the upper surface; the umbels are somewhat paniculated and terminal, the calyces are provided with stalklets; the fruits are not quite so large, while the fertile seeds are terminated by a conspicuous membrane. ("Eucalyptographia," under *E. miniata*.)

I will deal with this when I come to *E. ptychocarpa*.

In its bark *E. miniata* displays considerable affinity to the Corymbosæ.

DESCRIPTION.

CXXIV. E. phœnicea F.v.M.

In *Journ. Linn. Soc.*, iii, 91 (1859).

Then described by Bentham in B.Fl. iii, 251, and figured and described by Mueller in "Eucalyptographia."

It is a middle sized or small tree, the bark persistent or tardily falling off from the upper branches, and readily separable in flakes (Bentham, following Mueller).

The filaments are orange to scarlet, and hence it is a gorgeous species for tropical cultivation. The ovary is two-celled, usually a remarkable occurrence in the genus, but I have occasionally seen it three-celled. The drawing of the fruit in the "Eucalyptographia" does not show the longitudinal ribs.

It is called "Ngainggar" by the Koko-Yimidir aborigines (Endeavour River, &c., district). See W. E. Roth's Bulletin No. 2 of North Queensland Ethnography (1901).

RANGE.

The type was collected by Mueller on the sandstone tableland on the Victoria and Upper Roper Rivers, Northern Territory.

So far as our knowledge goes at present, it is rare. I have only seen the specimens collected by Mueller, and also G. F. Hill's No. 803, from sandstone country near Tanumbirini, Northern Territory.

Mueller ("Eucalyptographia") gives the range "On the sandstone tableland and also on sandy ridges from the Victoria River and its vicinity to Carpentaria, far eastward round the Gulf, often accompanied by *E. miniata*."

In his *Second Census* he does not record it from Queensland. Bailey (*Queensland Flora*, 631) admits it on the dubious evidence of "a log and some fragmentary specimens from the Gulf Country, which I considered probably a form of the above species, with whitish flowers."

On the other hand, Dr. Roth says the North Queensland aborigines gave it a name, which he quotes.

Before it is admitted into the Queensland Flora, specimens should be quoted. It is very probable that Leichhardt observed it on Queensland territory on his journey to Port Essington. It is, as Mueller points out, intermixed in the forest with that species, which it resembles a good deal, and some of his "Melaleuca Gum," referred to under *E. miniata*, may well include *E. phœnicea*, but this should be proved.

AFFINITIES.

1. With *E. miniata* A. Cunn.

In habit *E. miniata* approaches nearest to *E. phœnicea*, whose companion it is in Arnhem's Land and around the Gulf of Carpentaria, agreeing with it much in its laminated, friable, easily separable bark, which is, however, not persistent on the main branches, also more grey and less brown-yellowish outside; it accords furthermore with *E. phœnicea* in the brilliancy of its flowers, thus forming quite an ornament in the landscape, the name of the species being derived from the colour of the filaments like that of red lead. The bark contains more woody ramifications than that of E. *phœnicea*, but likewise reminds in external appearance and in fracture much of mica-schist, thus indicating for both these trees in the cortical system a peculiar section, that of the Lepidophloiæ, to which also *E. peltata* belongs. *E. miniata* differs from *E. phœnicea* in taller stature, in its branchlets, flower stalks, and calyces being tinged with a whitish bloom, in generally broader leaves with less stomata above than below, in umbels with less flowers, in the absence of distinct stalklets, in very angular and broader calyces, proportionately longer lid, in more saturated orange-coloured filaments, longer anthers, larger, very woody fruits, which latter are lined with prominent ridges and open with three or four valves; the fertile seeds are also larger. ("Eucalyptographia" under *E. miniata.*)

. . . . To which (*E. miniata*) it is also closely allied in its cortical characters, *E. phœnicea* and *E. miniata* standing in this respect quite apart from any other Eucalypt (unless *E. melissiodora*), constituting in the cortical system of the genus a peculiar section, that of *Lepidophloiæ*. The bark of both is very lamellar and friable, outside of a yellowish or greyish-brown, on fracture partly glittering and somewhat resembling mica-schist. In *E. phœnicea* the bark covers the lower branches, as well as the stem, persistently, but it is easily pulled off, and is less interwoven with fibres than in *E. miniata*, whereas also in the latter the bark persists on the stem only. ("Eucalyptographia" under *E. phœnicea.*)

There is no doubt that these two species have the closest affinity to each other. In the bush they require to be carefully compared, so that we may receive notes, made on the spot, by a competent observer, in regard to the habit, size of tree, bark, and timber, of both species.

The foliage of the two species is much alike; perhaps that of *E. phœnicea* is smaller and less coarse.

The buds of *E. miniata* are coarser, more sessile, fewer in the head, and on a strap-shaped peduncle. The branchlets and inflorescence are more glaucous in the specimens seen, but it should be locally observed whether glaucousness is a differentiating character.

The colour of the filaments of *E. miniata* is perhaps more scarlet; they are coarser. The anthers resemble each other a good deal. The fruits of *E. miniata* are larger and coarser.

2. With *E. corymbosa* Sm.

The urceolate fruits suggest an affinity, while the barks of both *E. phœnicea* and *E. miniata* undoubtedly display affinities to that of *E. corymbosa* and other members of the Bloodwood group.

Explanation of Plates (93–96).

PLATE 93.

E. erythronema Turcz.

1*a*. Twig with buds ; 1*b*, fruits. From a portion of the type labelled "No. 37, Drummond's 5th Collection, 1849 Supp."

2*a*. Leaf (rather large) ; 2*b*, buds ; 2*c*, buds (seven in the head) ; 2*d*, anthers, front and back views ; 2*e*, fruits. All from Kellerberrin, Eastern Railway, W.A. (F. Harvey Vachell.)

3. Fruits, approximating to those of var. *marginata* Benth., which I have not seen. Cowcowing, W.A. (Max Koch.)

E. acaciæformis Deane and Maiden.

4*a*, 4*b*. Juvenile leaves, Moona Plains, Walcha (A. R. Crawford) ; 4*d*, front and back view of anthers.

5*a*. Juvenile leaves ; 5*b*, mature leaf ; 5*c*, buds ; 5*d*, fruits. Yarrowitch, New England. (J. H. Maiden.) The type.

Variety *linearis* Deane and Maiden.

6*a*, 6*b*. Juvenile leaves ; 6*c*, mature leaf ; 6*d*, fruits. 16–17 miles east of Walcha. (J. H. Maiden.) The type.

7. Buds. Guy Fawkes, New England. (J. L. Boorman.)

8. Buds. Near Glen Innes. (H. Deane.)

9*a*. Seedling leaf ; 9*b*, mature leaf ; 9*c*, buds ; 9*d*, fruits. Macleay River, 18 miles east of Uralla. (R. H. Cambage.)

E. pallidifolia F.v.M.

10*a*. Leaves ; 10*b*, buds ; 10*c*, front and back view of anther. Arnhem's Land, Northern Territory. (F. Mueller.)

11*a*. Leaf ; 11*b*, fruits. Upper Victoria River, Northern Territory. (F. Mueller.) The type.

12. Leaves with buds having blunt opercula. "Gulf country." (Correspondent of F. M. Bailey.)

PLATE 94.

E. cæsia Benth.

1*a*. Twig with immature fruits ; 1*b*, twig with mature fruits ; 1*c*, fruit, looked at from above. All from the type, a specimen labelled "No. 36, J. Drummond, coll. 1849."

2. Bud, not fully ripe, from a specimen in the Melbourne Herbarium attributed to Drummond, but no number. Probably the type also.

E. tetraptera Turcz.

3*a*. Leaf and bud ; 3*b*, fruit ; 3*c*, fruit looked at from top. Near Cape Riche. (S. Dunn.)

4. Anthers, front and back view. (S. Dunn, W.A.)

PLATE 95.

E. Forrestiana Diels.

1*a*. Leaf and bud ; 1*b*, flower ; 1*c*, front and back views of anther, showing glandular filaments ; 1*d*, immature fruit. (All reproduced from Diels and Pritzel's "Fragmenta Phytographiæ Australiæ occidentalis" in Engler's *Bot. Jahrb.* xxxv, fig. 50, p. 440.)

2*a*. Leaf and mature fruit ; 2*b*, mature fruit looked at from top. Between Esperance and Norseman, W.A. (C. R. P. Andrews.)

E. miniata A. Cunn. (see also Plate 96).

3*a*. Juvenile leaves ; 3*b*, panicle of buds ; 3*c*, immature fruit. (From the type, collected by Ferdinand Bauer. In the Vienna Herbarium.)

4. Intermediate leaf. Providence Knoll, Northern Territory. (Professor W. Baldwin Spencer.)

PLATE 96.

E. miniata A. Cunn. (see also Plate 95).

1*a*. Small mature leaf; 1*b*, unexpanded anther. Walsh River, Queensland. (Correspondent of F. M. Bailey.)

2*a*. Mature leaf; 2*b*, buds, very corrugated, and with broad peduncle; 2*c*, front and back views of anther. Hell Gate, Roper River, Gulf of Carpentaria. (W. Baldwin Spencer.)

3*a*. Buds with terete peduncle; 3*b*, immature, urceolate fruit; 3*c*, mature fruit. Northern Territory, north of Lat. 15 degrees. (W. S. Campbell.)

4. Fruits. Darwin, Northern Territory. (N. Holtze, No. 3,059.)

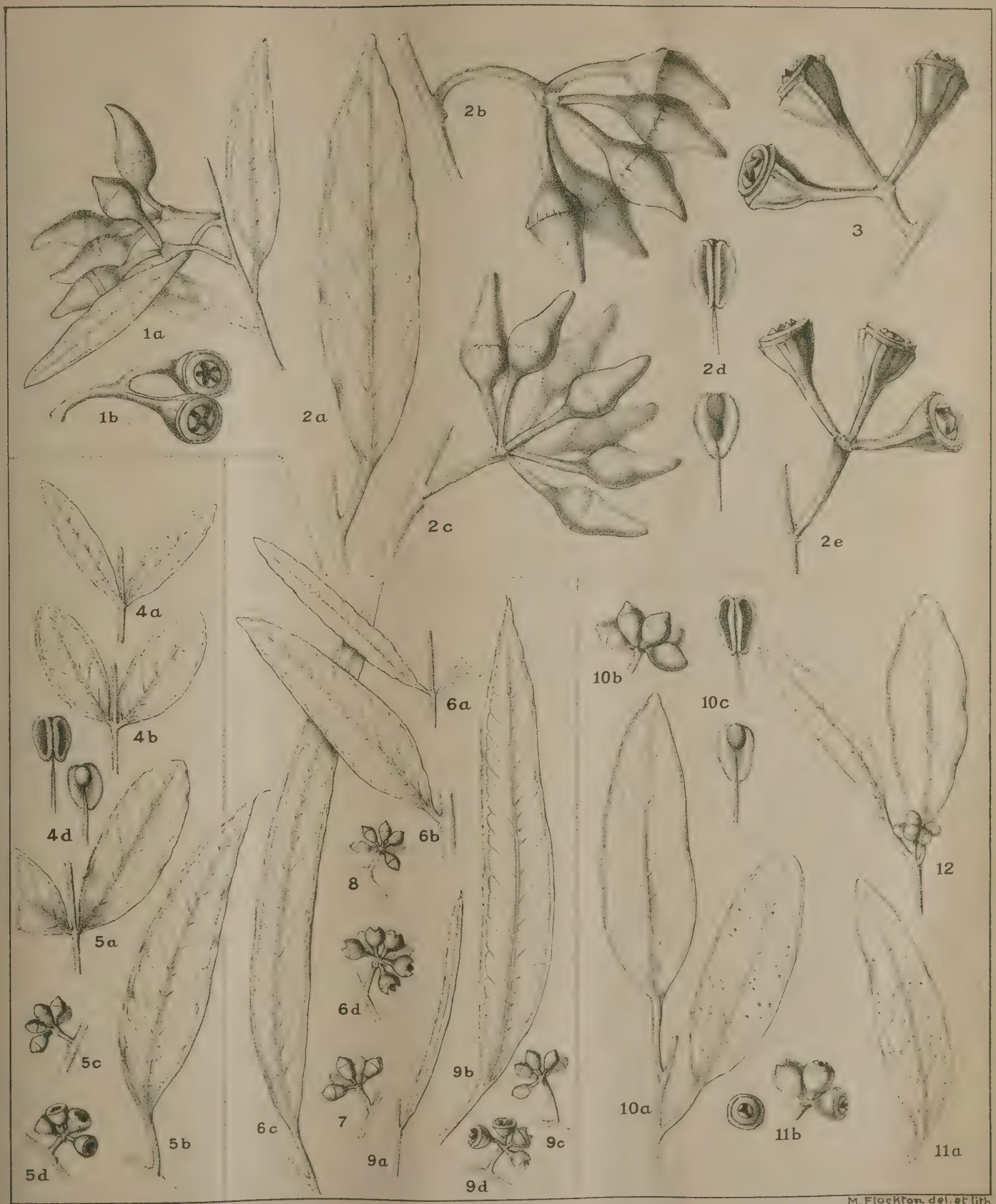
5*a*. Fruit; 5*b*, fruit, looked at from above. Table Top Mountain, Kimberley. (W. V. Fitzgerald.)

6*a*. 6*b*. Large fruits. Northern Queensland. (F. M. Bailey.)

E. phœnicea F.v.M.

7*a*. Mature leaf; 7*b*, buds; 7*c*, front and back view of anthers; 7*d*, three-valved and two-valved fruits. Northern Territory. (G. F. Hill, No. 400.)

8*a*. Fruits (Melbourne Herbarium); 8*b*, fruit looked at from above; note the two valves. (Northern Territory.) (? Collector.)



EUCALYPTUS ERYTHRONEMA, TURCZ. (*1–3*)

E. ACACIÆFORMIS, DEANE AND MAIDEN (*4–5*); *var. linearis*, DEANE AND MAIDEN (*6–9*).

EUCALYPTUS CAESIA, BENTH. (*1–2*).

E. TETRAPTERA, TURCZ. (*3–4*).

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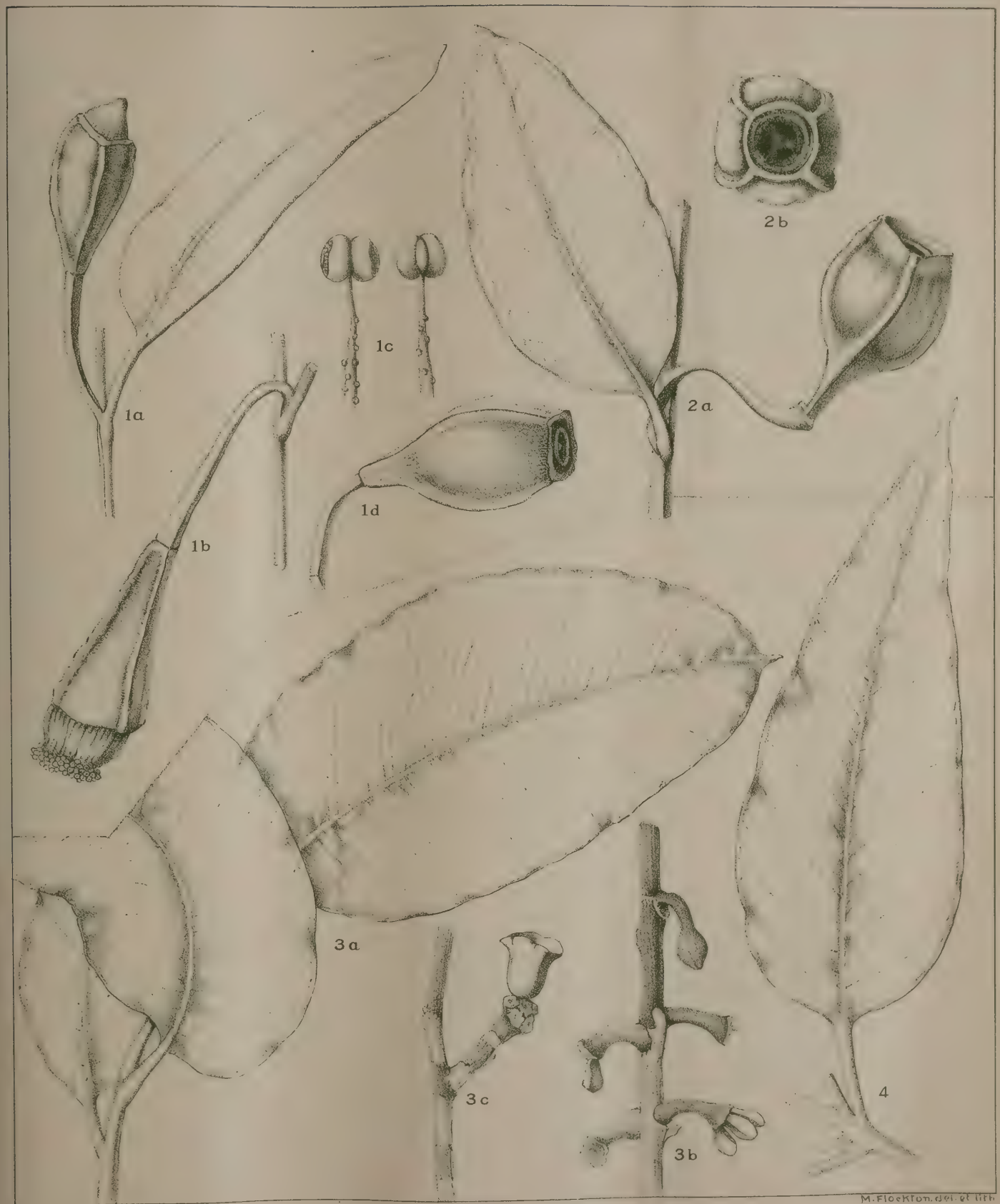
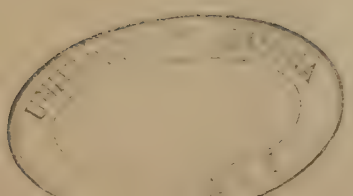


EUCALYPTUS FORRESTIANA, DIELS. (*1–2*).

E. MINIATA, A. CUNN. (*3–4*). [See also Plate 96.]



EUCALYPTUS MINIATA, A. CUNN. (*1–6*). [See also Plate 95.]

E. PHŒNICEA, F.v.M. (*7–8*).

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The following species of **Eucalyptus** are illustrated in my "**Forest Flora of New South Wales**"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets:—

acacioides, A. Cunn. (xlviii).
acmenioides, Schauer (xxxii).
amygdalina, Labill. (xvi).
Andrewsi, Maiden (xxi).
Baileyana, F.v.M. (xxxv).
Behriana, F.v.M. (xlvi).
bicolor, A. Cunn. (xliv).
Boormani, Deane and Maiden (xlv).
Bosistoana, F.v.M. (xliii).
capitellata, Sm. (xxviii).
Consideniana, Maiden (xxxvi).
coriacea, A. Cunn. (xv).
corymbosa, Sm. (xii).
crebra, F.v.M. (liii).
dives, Schauer (xix).
fruticetorum, F.v.M. (xlii).
gigantea, Hook. f. (li).
goniocalyx, F.v.M. (v).
hæmastoma, Sm. (xxxvii).
hemiphloia, F.v.M. (vi).
longifolia, Link and Otto (ii).
Luehmanniana, F.v.M. (xxvi).
macrorrhyncha, F.v.M. (xxvii).
maculata, Hook. (vii).
melanophloia, F.v.M. (liv).
melliodora, A. Cunn. (ix).
microcorys, F.v.M. (xxxviii).
microtheca, F.v.M. (lii).
numerosa, Maiden (xvii).
obliqua, L'Hérit. (xxii).
ochrophloia, F.v.M. (l).
odorata, Behr and Schlechtendal (xii).
paniculata, Sm. (viii).
pilularis, Sm. (xxxi).
piperita, Sm. (xxxiii).
Planchoniana, F.v.M. (xxiv).
populifolia, Hook. (xlvii).
punctata, DC. (x).
regnans, F.v.M. (xviii).
resinifera, Sm. (iii).
saligna, Sm. (iv).
siderophloia, Benth. (xxxix).
sideroxylon, A. Cunn. (xiii).
Sieberiana, F.v.M. (xxxiv).
stellulata, Sieb. (xiv).
tereticornis, Sm. (xi).
virgata, Sieb. (xxv).
vitrea, R. T. Baker (xxiii).

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* Government Printer, Sydney. 4to. Price 1s. per part (10s. per 12 parts); each part containing 4 plates and other illustrations.

Sydney: William Applegate Gullick, Government Printer.—1914.

A Critical Revision of the genus Eucalyptus

BY

J. H. MAIDEN

(Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney).

Vol. III. Part 3.

Part XXIII of the Complete Work.

(WITH FOUR PLATES.)

"Ages are spent in collecting materials, ages more in separating and combining them. Even when a system has been formed, there is still something to add, to alter, or to reject. Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages. In these pursuits, therefore, the first speculators lie under great disadvantages, and, even when they fail, are entitled to praise."

MACAULAY'S "ESSAY ON MILTON."

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CXXV. Eucalyptus robusta Smith.

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CXXVI. Eucalyptus botryoides Smith.

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CXXVII. Eucalyptus saligna Smith.

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DESCRIPTION.

CXXV. E. robusta Smith.

In *Zoology and Botany of New Holland* by G. Shaw and James Edward Smith, Vol. i, pp. 39, 40, 1793, with Tab. xiii.

FOLLOWING is a copy of the original, which I reprint because the work is rare, and the description is instructive:—

Eucalyptus robusta

Brown Gum Tree, or New Holland Mahogany.

Icosandria Monogynia.

Gen. Char. Cal. superus, persistens, truncatus, ante anthesin tectus *operculo* integerrimo, deciduo. *Cor.* nulla. *Caps.* quadrilocularis, apice dehiscens, polysperma.

Cal. superior, permanent, truncated, covered before flowering with an entire *lid*, soon falling off. *Cor.* none. *Caps.* of 4 cells, opening at the top, containing many seeds.

Spec. Char. E. operculo conico medio constricto, umbellis lateralibus terminalibusque; pedunculis pedicellisque compressis.

Lid conical, contracted in the middle. Umbels lateral and terminal; general and partial flower-stalks compressed.

Eucalyptus robusta is one of the largest and loftiest of trees, frequently 100 feet in height; its wood hard, heavy and strong, of a reddish colour, and abounding with resin. *Branches* round below, covered with smooth bark, very angular towards the extremity. Leaves *alternate*, on foot-stalks, firm, smooth, with a strong rib and fine parallel veins, ovate, pointed, entire, generally oblique, and often a little unequal at the base, but not universally so. *Stipulae* none. *Umbels* on flower-stalks frequently from the axillae of the leaves, and solitary, sometimes two or more together, forming a sort of alternate *racemus*, and sometimes such *racemi* terminate the branches. *Bracteae* none. *General flower-stalk* an inch or more in length, compressed, two-edged, dilated upwards; *partial ones* about eight or ten together, nearly of the same form, but much shorter, single-flowered, dilated into the base of the calyx. *Flowers* yellowish, occasionally with a red tinge. Calyx obconical, sometimes round, often two, or even four-edged, entire; *lid* rather more than equal to it in length, swelling above the base, then suddenly contracted, and terminating in a blunt, slightly curved, conical point. When the lid falls off, it discloses numerous *stamina*, which soon spread very wide. The *style* stands on four cross ribs in the centre of the flower, which crown the germen; it is club-shaped, compressed or angular; *stigma* simple; *germen* in the bottom of the calyx. We have not seen the fruit ripe. Every part of this plant, and indeed of every other *Eucalyptus* we have examined, is void of all pubescence. This is not so highly aromatic as some other species, though very perceptibly so when rubbed, and it is likewise astringent and acrid. Its resin is an inferior sort of red gum, of a brown hue. The size and strength of the tree, like that of the European *Quercus Robur*, seem particularly to justify the name *robusta*.

Explanation of Tab. xiii.

1. A young flower. 2. Calyx. 3. Lid. 4. Stamina not full grown. 5. A complete stamen. 6. Style.

The original figure is excellent, and a portion of it is reproduced at fig. 1, Plate 97.

Sir J. E. Smith redescribed it in *Trans. Linn. Soc.* iii, 283 (1797), in the following words:—

Operculo conico medio constricto calyce latiori, umbellis lateralibus terminalibusque foliis ovatis *E. robusta* "Bot. of New Holland, 40, t. 13." This is called the Brown gum tree, or New Holland

Mahogany, its wood being red, hard and heavy, in some degree answering the purposes of the West Indian Mahogany. Its leaves are broader than in any other species that has come to my knowledge, and the flowers larger, except only those of *E. corymbosa.*

It is described in B.Fl. iii, 228, but the reference to "White Mahogany" is a slip on somebody's part, since that is the name usually applied to *E. acmenioides* Schauer, and never to *E. robusta* Sm.

E. robusta is figured and described in Mueller's "Eucalyptographia."

The juvenile leaves are broadly ovate, nearly orbicular, and acuminate, and it sometimes has more or less urceolate fruits.

The bark is brownish, sub-fibrous, scaly.

SYNONYMS.

1. *E. rostratus* Cav.

2. *E. multiflora* Poiret.

3. Var. of *E. persicifolia* Lodd. (See also Don's *Dichlamydeous Plants*, ii, 818) = *E. multiflora* Poir., which is, according to specimens in Herb. Berlin, examined by me, *E. robusta* Sm.

1. *E. rostratus* Cav. *E. rostratus*, Tab. 342.

374. Eucalyptus foliis ovato-lanceolatis, valde acuminatis, nitidis: calyptra rostrata.

Caulis arboreus 15–20 pedes altus ramis alternis.

Folia alterna ovato-lanceolata, 4–12 pollices longa, duos lata, valde acuminata, nitida, coriacea, nervis innumeris ad unicum longitudinalem parum obliquis, sustenta petiolo pollicari subalato.

Flores umbellati, umbellis axillaribus solitariis.

Calix longior quam in praecedentibus, cujus calyptra rostrata rostro compresso.

Germen ovato-tetragonum in fundo calicis, hujusque parieti conglutinatum: stylus subulatus.

Reliqua ut in praecedentibus.

Fructum non vidi, qui ex germine videtur quadrilocularis.

Habitat cum praecedentibus: floretque Aprili. Ex eodem herbario.

Explic. tab. *a.* Flos cujus calyptra dehiscit, et stamina evolvuntur. *b.* Idem absque calyptra. *c.* Calicis sectio ut appareat germen. *d.* Germinis aucti sectio.

Obs. Praeter istas species alias vidi in laudato herbario, non ita perfecte conservatas ut iconibus eas sistam quas nihilominus indigitabo brevi descriptione. (*Cav. Ic.* Vol. iv, p. 23 [1797]).

A portion of the figure has been reproduced at fig. 2, Plate 97.

2. *E. multiflora,* Poir.

Eucalyptus à fleurs nombreuses. Eucalyptus multiflora.

Eucalyptus operculo conico, longitudine calicis; umbellis lateralibus, multifloris; pedunculo compresso, pedicellisque angulosis; foliis ovato-oblongis, acutis. (N.)

Ses rameaux sont cylindriques, d'un vert-pâle & cendré, tors, aplatis & anguleux à leur partie supérieure; les feuilles alternes, pétiolées, épaisses, coriaces, d'un vert-pâle, ovales, alongées, aiguës, très-entières, longues de cinq à six pouces, à nervures très-fines, presque parallèles, rétrécies, à peine obliques à leur base; les pétioles longs d'un pouce; le pédoncule latéral, comprimé, élargi, anguleux,

soutenant environ douze à quinze fleurs & plus, pédicellées ; les pédicelles anguleux, longs de quatre à six lignes ; le calice ovale, un peu pyriforme, surmonté d'un opercule conique, à demi hémisphérique à sa base, de la largeur du calice, terminé par une corne droite, obtuse, aussi longue que le calice.

J'ignore le lieu natal de cette plante, que j'ai vue dans l'herbier de M. Desfontaines.

Observations.—Je n'ai point parlé de deux espèces cultivées au Jardin des Plantes, & mentionées dans le *Catalogue* sous les noms d'Eucalyptus angustifolia,—oppositifolia. On n'en connoît encore que les feuilles : la première remarquable par ses feuilles étroites, lancéolées ; la seconde par ses feuilles presqu' opposées, médiocrement pétiolées, lancéolées, très-aiguës, à nervures simples, parallèles. Elles sont toutes deux originaires de la Nouvelle-Hollande. (Poir. *Encyc. Suppl.* ii, 594, 1785.)

I have seen the following specimens of the old collectors :—

a. "*Eucalyptus robusta*, N. Holland, Dr. Smith ex. herb. Lambert" in Herb. Cant. (obviously a co-type).

b. No. 4,746 collected by Robert Brown, 1800–04, Port Jackson.

c. *Eucalyptus robusta* var. *b. rostrata* in A. Cunn.'s handwriting, which is a piece of normal *E. robusta.*

d. No. 480 Sieber, New Holland.

e. "*Eucalyptus robusta* Sm. (*E. rostrata* Cav.) De la Nouvelle Hollande. No. 480. M. Sieber, 1823."

f. "Eucalyptus capitellata Sm. de l'ile Maurice M. Sieber, 1826, No. 318," with the additional printed label "Fl. maurit. ii, No. 318."

Both these specimens are in Herb. Barbey-Boissier and are *E. robusta* Sm. The second specimen gives a reference to Sieber's botanical trip to the Mauritius.

Another specimen bears the label—

g. "Sieberi Flora Mauritiana Exsicc., part ii, No. 318; Fl. maurit. ii, No. 318."

h. M. Verreaux No. 11, 1845, Nouv. Hollande, Côté Orientale.

RANGE.

It is a coast-district species, confined to New South Wales and Queensland, and extending from Twofold Bay in the south of New South Wales to South Queensland in the north. It does not extend far inland; in the county of Cumberland or Sydney district it has not been noted further than Richmond and the Lower Hawkesbury.

Southern Localities.—Vicinity of Twofold Bay, near Merimbula ("Eucalyptographia"); Narrawallee, Milton, towards Conjola (R. H. Cambage); West Cambewarra (J. V. de Coque).

In the Sydney district it is found in many parts of Port Jackson, and north and south of the same, *e.g.*—near Parramatta; Drummoyne Park; Five Dock;

Outer Domain; "Swamp Mahogany, Sydney, at the sleeping place, Sept., 1807," (G. Caley); Rose Bay; Manly; Bondi; Kogarah, with small urceolate fruits (J. H. Camfield); La Perouse, and Botany Bay generally.

Western Locality.—Richmond (S. C. Burnell).

Northern Localities.—Gosford; Port Stephens (J. L. Boorman); Dirty Creek, Port Stephens (A. Rudder); Bulladelah, 2′, 70′, (F. Mecham); Port Macquarie (J.H.M.); Raleigh, Bellinger River (E. H. F. Swain); Woolgoolga (E. H. F. Swain); Byron Bay (J.H.M. and J. L. Boorman); Lismore (Miss Rothwell); Ballina, on sandhills near swamps, 20–25 feet high, with small fruits (W. Baeuerlen).

As regards Queensland localities, the late Rev. B. Scortechini remarks (*Proc. Linn. Soc. N.S.W.*, viii, 248), "I found it growing in wet places not far off the banks of Nerang Creek. Since then Mr. F. M. Bailey and I found it at Stradbroke Island, close to Dunwich. Afterwards I followed its course to the Brisbane River, and as far inland as Brown Plains, not far away from the Logan. In all instances this gum-tree was found growing on wet marshy ground, having for its companion *Melaleuca leucadendron* Linn. Whether this tree crosses over to the north side of the Brisbane River remains to be proved by further investigation."

Bribie Island, Moreton Bay (R. N. Jolly).

AFFINITIES.

1. With *E. resinifera* Sm.

E. robusta resembles in some respects *E. resinifera*, but the leaves are generally broader, of a lighter color above and more shining beneath, their veins are more prominent, not almost horizontally spreading, nor is the intra-marginal vein nearly contiguous with the edge; the flowers are larger, the tube of the flowering calyx is longer and more bellshaped, the lid more turgid beneath, the fruit considerably longer, the valves are enclosed, convergent and remaining often connected at their summit, while the fruit-rim is thinner and surrounded by a narrower ring. However, the variety *pellita* of *E. resinifera* has the large flowers and broad leaves of *E. robusta*, but the proportionately short fruit with exserted and mostly free, erect and acute valves of the former. ("Eucalyptographia" under *E. robusta*.)

I do not think that the affinities are close. *E. robusta* is a coast-loving species; *E. resinifera* ascends the coast range. The former has a softish, almost scaly bark; the latter is a larger tree with almost stringy bark; the buds and fruits of the two species are very dissimilar, and those of the former are, like the leaves, coarser than those of the latter species. Both yield red timbers not very dissimilar in general appearance; that of the former being called "Swamp Mahogany," and that of the latter "Red or Forest Mahogany."

2. With *E. saligna* Sm.

From *E. saligna*, which comes in most of its characteristics near to *E. botryoides* and *E. resinifera*, we can distinguish *E. robusta* already by the persistency of the bark of the latter. ("Eucalyptographia" under *E. robusta*.)

I shall show later that there is a very close affinity between *E. saligna* and *E. botryoides*, and the affinity of *E. robusta* is closer to the *E. botryoides* end of the chain.

3. With *E. botryoides* Sm.

E. robusta is known as distinct from *E. botryoides* by the larger size of the flowers and fruits and often also the leaves, by the more extended flowerstalks and particularly by the longer-pointed pale never shining lid, which at the base is broader than the calyx-tube, and by the longer fruits with comparatively narrow and almost permanently coherent valves. ("Eucalyptographia" under *E. botryoides*.)

It is with *E. botryoides* that *E. robusta* has its closest affinities. Both are coast-loving species, umbrageous in habit, but the branches of *E. robusta* are more erect, and its foliage larger and coarser,—more *Ficus*-like (*indica*, *macrophylla*, &c.). The buds of *E. robusta* are habitually more pointed, and like the fruits, larger. In *E. robusta* the flowers are much more frequently pedicellate than are those of *E. botryoides*. The barks of the two trees are often similar, but in *E. botryoides* there is a tendency to smoothness in the branches and even the upper part of the trunk, which does not appear to be the case in *E. robusta*. The timber of the two trees are not very dissimilar; this is recognised by bushmen, who call *E. robusta* "Swamp Mahogany" and *E. botryoides* "Bastard Mahogany."

DESCRIPTION.

CXXVI. E. botryoides Smith.

In *Trans. Linn. Soc.* iii, 286 (1797).

FOLLOWING is the original:—

Operculo hemisphaerico submutico, capitulis lateralibus solitariis, pedunculis cuneatis compressis, fructu turbinato.

This, like the two preceding (*capitellata* and *saligna*), bears its flowers in solitary capitula, but is distinguished from them by its broad hemispherical opercula, with scarcely any point at its summit, which, from the clustering together of the flowers, look like bunches of some kind of berries. The common flower-stalks are flat and very broad, especially at the top. The leaves lanceolate, oblique.

It is a beautifully umbrageous tree, the juvenile foliage being thin, and with pale undersides.

It varies as to the extent of persistency of the rough bark, the amount of fibre of the same, and whether it extends to the ultimate branchlets or not.

The buds of the type had "broad hemispherical opercula, with scarcely any point at its summit." (See fig. 4*a*, Plate 99.) Some buds from Kurnell have pointed opercula (*e.g.*, fig. 5*a* and 10). Specimens from Green Point near Gosford (A. Murphy), stated by him to have "rough bark to the limbs but not Bangalay," have buds with very pointed opercula, and in my view can only be referred to *E. botryoides*, so that we have a remarkable amount of variation in the bud.

Looking down on the top of a ripe fruit the tops of the valves take on the appearance of a Maltese Cross. The same appearance is seen in *E. saligna*, though it is not as obvious as in typical *E. botryoides*.

SYNONYM.

E. platypodos Cav. *Icones* iv, 23, t. 341 (1798 ?).

Eucalyptus platypodos. Tab. 341.

373. Eucalyptus foliis alternis lanceolato-acutis subfalcatis: umbellis florum solitariis, pedunculo communi plano.

An Metrosideros salicifolia *Gaertneri vol.* 1, *tab.* 34, *fig* 3*a*?

Caulis aborescens ramis alternis.

Folia, ut in praecedenti, attamen longiora et duriora.

Flores umbellati, umbellis solitariis axillaribus, quorum pedunculus communis brevis compressus, flores sustinens 3–6 sessiles.

Calix, calyptra et genitalia ut in praecedenti, at diaphragma infundibuliforme.

Capsula corticata calice, tunc fere cylindrico, quadrilocularis, quadrivalvis, loculis polyspermis. Semina parva angulata ferruginea.

Habitat floretque cum praecedente. Ex eodem herbario.

Explic. tab. *A* Rami fructiferi pars. *a* Calix fructifer. *b* Idem sectus perpendiculariter ut appareat capsula. *c* Ejusdem sectio horizontalis. *d* Semen. *e* Calix calyptratus. *f* Flos calyptra dehiscente. *g* Calicis floridi aucti sectio ut appareat diaphragmatis et germinis situs. *h* Germen.

Supposed Variety.

Theso-called variety "with the ovary more conical in the centre and the operculum shortly beaked, Paterson's River, "Blue Gum," *Herb. R. Brown.*" (B.Fl. iii, 229, under *E. botryoides*) is *E. saligna.*

I have already referred to specimens (*e.g.*, Green Point, Gosford, N.S.W.) with very pointed opercula, and in other respects differing from the type, but it does not seem worth while to name these as a variety.

Hybridism.—This is a species which undoubtedly cross pollinates with other species, and these forms will be dealt with when the general question of hybridism in the genus is taken up.

RANGE.

It is confined to eastern and south-eastern Australia, not occurring far from the sea. The type was described from Port Jackson. It occurs from coastal Gippsland (Victoria), and along the New South Wales coast for about 150 miles north of Port Jackson, and very doubtfully to South Queensland. I have not seen undoubted specimens of the species from the northern State, and it should not be included in the Queensland flora without proper evidence. The confusion which has arisen between it and *E. saligna* is referred to at page 53.

"Probably it does not extend into Queensland, as the Blue Gum tree mentioned from thence is referable to a species of the series of Leiophloiæ, probably *E. saligna.*" ("Eucalyptographia" under *E. botryoides.*)

Victoria.

The following localities are all from Eastern Gippsland:—

"Mahogany Tree of Snowy River," Orbost (H. Hopkins); Lake Tyers (H. Hopkins); sea coast at Lake King (Mueller); Raymond Island, Lake King (H. Hopkins); Metung (A. W. Howitt, J.H.M.).

New South Wales.

Southern Localities.—Woolly Butt," Milton (R. H. Cambage, J. L. Boorman); Jervis Bay (J.H.M.). Some specimens with fruits nearly as large as *E. robusta*; Banks of Yalwal River, near Shoalhaven (W. Forsyth and A. A. Hamilton); Shoalhaven (W. Baeuerlen); Jamberoo (J. H. Camfield); Wollongong (W. D. Francis); Coal Cliff Creek (H. Deane); Otford to Stanwell Park (R. H. Cambage and J.H.M.).

Sydney District.—Port Jackson (Robert Brown), 1802–5, No. 4,751; Mrs. Macquarie's Chair, Outer Domain (J. H. Camfield); Mosman's Bay (Rev. J. W. Dwyer); Manly (Rev. Dr. Woolls); Concord (J.H.M.); Rockdale (H. Deane, J. H. Camfield); Botany (H. Deane); La Perouse (J.H.M.); with pointed opercula. Kurnell (J. L. Boorman); National Park (J. L. Boorman).

Northern Localities.—Sandgate, Newcastle (Jesse Gregson); in patches on the ridges near Port Stephens (W. R. Stacy).

AFFINITIES.

1. With *E. saligna* Sm.

We have here one of the most instructive examples I know of, in which two species, reputedly well known, run into each other. I cannot separate some of the forms, and therefore there is much to be said for my view to make one a variety of the other. On the other hand, there is much to be said for the view that the two ends of the series should be looked upon as distinct species, viz., *saligna* and *botryoides*. The more I examine the position, the more I am puzzled, and as a matter of pure expediency I separate the two so-called species in this Part.

I reprint part of my paper in *Proc. Linn. Soc. N.S.W.*, xxx, 502 (1905), with some unimportant additions :—

E. saligna Sm., and *E. botryoides* Sm. (*E. botryoides* Sm. = *E. saligna* Sm. var. *botryoides*, var. nov.).

I propose to show that the above two species are conspecific. Their affinity long ago impressed me. In 1889* I wrote, "In external appearance and timber it (*E. botryoides*) seems to merge into *E. saligna*." I have examined the trees for many years, latterly with Mr. R. H. Cambage, to settle this one point, *i.e.*, is there any character to separate the species? To carry out this work we chose (amongst other localities) the Brisbane Water (N.S.W.) district, which is the home of typical "Blue Gum" (*E. saligna*), and the Otford (Stanwell Park) district, in which typical *E. botryoides* is abundant.

We found *E. saligna* with *rough bark* up to the first fork, and even higher up, in shallow valleys facing the sea, *e.g.*, at Kincumber, Brisbane Water. From the Blue Gum flats (with good soil) in the neighbourhood, with their typical examples of the species, as we approach the sea and the innutritious sandy soil and strong sea breezes, we find that the rough bark gradually creeps up the butt, and the trees themselves become more crooked, and even gnarled, finally merging into *E. botryoides*. The same thing was noticed in southern localities.

The following states the case in regard to typical specimens :—

"The differences between *E. saligna* and *E. botryoides* are habitually very great on account of their respective bark—thin, smooth, and pale in the one; thick, rough, and dark in the other; but the characteristics of the flowers and fruits are far less marked, being almost reduced in *E. botryoides* to a shorter and blunter lid, an usually more angular tube of the calyx, and retracted totally enclosed valves of the fruit." (Eucalyptographia, Mueller, under *E. saligna*.)

In the same work, under *E. botryoides*, he says :—"When the tree has arisen on rich soil along running streams, its wood is regarded as one of the best among those of Eucalypts. . . . [this is *E. saligna*.—J.H.M.]; when the tree grows on the coast sands, its wood is still useful for sawing and fencing, though the stems occur there often gnarled. . . . [this is *E. botryoides*.—J.H.M.]. *E. saligna* is in nature easily enough distinguished by the smoothness of its bark, which secedes in its outer layers successively; otherwise the differences are slight, consisting in the often somewhat longer lid, and in fruits with half exserted valves."

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*"Useful Native Plants of Australia," p. 435.

E. saligna is the stately "Blue Gum" of rich soil flats, which yields the timber so well and so favourably known in New South Wales. Bark smooth, and with a little rough bark at the butt. *E. botryoides* is known as "Bangalay" or "Bastard Mahogany," and is a rough-barked (corky scaly) gnarled tree found in low-lying situations near the sea. *E. botryoides* has coarser fruits, with the valves not exserted; buds coarser, more squat; opercula more blunt. I see no difference in the seedling leaves or in the timber. Between the two types, as already defined, I find perfect connecting links; and the differences are, I am satisfied, entirely owing to soil and aspect.

Messrs. Baker and Smith distilled leaves of *E. saligna* from Lismore, N.S.W., and of *E. botryoides* from Milton, N.S.W., and found differences in the composition of the particular distillates obtained by them.* I would suggest that here we have an excellent opportunity, by making a series of distillations of leaves of *E. saligna* and *E. botryoides* to see whether any real difference between the trees can be ascertained that morphology fails to show. I believe that, by testing, at the same season, the trees which morphologically show a complete transition between the two species, the oils would show a transition equally complete.

Holding the views that I do as to the identity of *E. saligna* and *E. botryoides*, I am obliged to combine them. I therefore propose to reduce *E. botryoides* to a variety of *E. saligna*. Both species were described by Sir James Smith in the same paper,† but, following the precedent that has been adopted by a number of botanists, *E. saligna* (p. 285; *E. botryoides* is p. 286) is the earlier name because it was described earlier in the paper.

New South Wales is the home of the types, both of *E. saligna* and *E. botryoides*. It will be convenient, as will be seen presently, to deal with *E. saligna-botryoides* in this order:—Queensland, New South Wales, Victoria.

Queensland.—Following are notes showing the additions Mr. F. M. Bailey has made in his "Queensland Flora" to Bentham's "Flora Australiensis":—

E. botryoides, Sm. "A tall, handsome tree, with a rough, furrowed, persistent bark *towards the base, white and smooth on the upper part of trunk and branches.*" Mr. Bailey only adds the words in my italics, which are a description of the bark of typical *saligna*.

He adds: "Brisbane; various southern localities, in mountain gullies and river flats (probably the largest tree of the Queensland species). Wood of a red colour, close in grain, hard, tough, and durable; useful in large buildings, wheelwrights' work, and in all work where large beams of hardwood are required." This is an accurate description of *E. saligna*.

The only alleged Queensland locality given in the "Flora Australiensis" ("Brisbane, Blue Gum, McArthur, No. 91, of Paris Exhibition Woods") is founded on an error, as will be explained later.

Coming to *E. saligna* Sm., Bentham in the "Flora Australiensis" omits Queensland, but Bailey adds "Forests in southern parts," and describes the timber: "Wood very tough and close-grained; very hard; of a grey colour," which is not a description of *saligna* timber.

In the "Catal. of the Queensland Forestry Museum" (Forest Branch, Lands Department, 1904) we have:—

(*a*) "No. 241. Grey Gum (*Eucalyptus saligna*): Plentiful: generally found on mountain slopes or in deep gullies on and near the coast of Southern Queensland. Usually a very tall tree, with thick grey bark, and having longitudinal patches of a brownish colour. Wood red colour, close-grained, hard, and durable. Logs split rather freely at the ends on quarter. Used for general building purposes. This is undoubtedly *E. saligna*.

(*b*) "No. 260. Flooded Gum (*Eucalyptus botryoides*): Plentiful in moist situations, on the borders of scrubs and mountain gullies along the coast of Southern Queensland. A very large tree, with a long smooth trunk of almost perfect cylindrical form, extending often 50 or 60 feet without a branch; bark deciduous, falling off in long narrow strips, often very white, and sometimes of a pale-green colour. Wood pink-brown; not so hard or heavy as many other Eucalypts. Splits on the quarter rather freely. Logs, when cut about six months, will almost float in sea-water. Used for general building purposes, but will not last in the ground. Makes good flooring and weatherboards, joists, and studs. Being comparatively light, it is suitable for punt-building." This is, doubtless, that form of *E. saligna* known in New South Wales as "Flooded Gum," and discussed by me at length in *Agric. Gazette*, N.S. Wales, and in the "Forest Flora" of N.S. Wales (Part iv, p. 75). (It is var. *pallidivalvis*, Baker and Smith.)

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*"Research on the Eucalypts." † *Trans. Linn. Soc.* iii, 1797.

In the Report of Tests on "Blue Gum" from Queensland, experimented upon by the Victorian Timber Board, 1884, this timber is called *E. botryoides*—additional evidence of the confusion of nomenclature.

I have indubitable specimens of *E. saligna*, or its variety *pallidivalvis*, from the following Queensland localities:—"Three-mile Brush, Moreton Bay," and other Queensland localities (Leichhardt). Maroochie; Eumundi (F. M. Bailey); Brisbane (J. L. Boorman, J.H.M.).

Speaking of *E. botryoides*, Mueller ("Eucalyptographia") says:—"Probably it does not extend into Queensland, as the Blue Gum-tree mentioned from thence is referable to a species of the series of Leiophloiæ, probably *E. saligna*."

Following is the history of the Brisbane Water, N.S.W., specimens which have caused such confusion through the locality being mistaken for Brisbane, Queensland.

The following specimens are in Herb. Kew, where I examined them:—

(*a*) "No. 91. Sydney woods," labelled "100–160 ft., Brisbane River* Gum, W. Macarthur, 1854" (for the Paris Exhibition, 1855). (See also B.Fl. iii, 229.)

(*b*) "No. 18. Blue Gum." This specimen bears the further label, "Corresponding with wood collection in Museum Coll. by Macarthur and others, S. district, N.S. Wales, London Exhibition, '62."

Sir William Macarthur's catalogue ("Catal. of N.S.W., &c., Timbers at the Paris Exhibition, 1855") gives the following additional information:—"Aboriginal name at Illawarra, 'Couranga'; the Blue Gum of the Coast districts, particularly at Brisbane Water. Diameter 40–72 inches, height 100–160 feet. A magnificent timber for ship-building, and a favourite wood for house-carpentry; not nearly so hard or heavy, and not so durable as the Ironbarks."

Both these herbarium specimens are in bud only, and refer to the same samples, No. 18 being the number of the same timber specimen (London Exhibition, 1862) which at the Paris Exhibition of 1855 bore the number 91.

They were labelled *E. botryoides* by Bentham and referred to in the "Flora Australiensis" under that species.

Following are some further New South Wales specimens also examined by Bentham. They were exhibited by Macarthur at the Paris Exhibitions of 1855 and London 1862.

"Nos. 42 (London), 94 (Paris) "Bangalay" or "Swamp Mahogany" of Brisbane Water. Diameter, 30–36 inches; height, 40–80 feet. A crooked-growing tree, the timber much valued for knees and crooked timbers of coasting vessels.

"No. 136. Sydney woods, Paris Exhibition, W. Macarthur, 1854." Its number in the London Exhibition Catal. was 43. Sir William Macarthur called this "Swamp Mahogany" (a name now reserved, as far as possible, for *E. robusta*), and stated that the aboriginal name at the Illawarra is "Burram Murra." His further note is:—"Diam. 36–60 inches, height 60–100 ft. A useful timber for inside work, but not equal to the better sorts of Eucalypti in strength or durability." In bud and nearly ripe fruit. Specimen in Herb. Kew, where I saw it.

"No. 244. Sydney woods, Paris Exhibition, W. Macarthur, 1854, from Appin, 50–80 ft." In the Exhibition Catalogue, Sir William Macarthur gives the following additional information:—"Name in Cumberland and Camden 'Grey Gum,' and 'Maandowie' (aboriginal). Diameter 24–48 inches, height 60–100 ft. An excellent gum timber."

Bentham has marked this specimen *E. botryoides* (?). It is in bud only, is in Herb. Kew, where I examined it. Macarthur calls this "Grey Gum," a name never applied to *E. botryoides*, but sometimes applied to *E. saligna*.

New South Wales.—Both *E. saligna* and *E. botryoides* are common in the Sydney district. Southward from Milton, I have no specimens of *E. saligna* other than with a rough bark. These connect with the Victorian trees.

The following notes in regard to New South Wales trees will be suggestive. *E. saligna* is common on the northern tableland, extending from the Hunter to New England. It is to be found at the foot of Mt. Lindsay, with rather small fruits and very exserted valves (W. Forsyth). I have it also from the Macpherson Range, on both sides of the New South Wales–Queensland border (W. Dunn).

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* Brisbane Water is at the mouth of the Hawkesbury River, about 50 miles north of Sydney. The "Brisbane River" is, of course, in Queensland. The label is in Sir William Macarthur's handwriting, and is a slip of the pen for "Brisbane Water."

Local name, "Woolly Butt," aboriginal name, "Mudione." Height 130 ft., diam. 2 ft. 6 in. Near Nelligen (J. S. Allan). As regards "Woolly Butt," this is a name that as between *E. botryoides* and *E. saligna* could only be applied to the former, yet the herbarium specimens are typical *saligna*.

"Woolly Butt," South-west Milton. The fruits rather like those of *E. saligna* (R. H. Cambage). "Woolly Butt," Burrill, Milton. The fruits like those of *E. botryoides* (R. H. Cambage).

Going south, typical *saligna* may be found in the Bateman's Bay district, which is the southernmost locality known to me. At p. 436 of my "Useful Native Plants of Australia" is a note of a specimen (there referred to *E. botyroides*) which is very interesting. It is a "White or Scribbly Gum."

Going north, *E. botryoides* is common from Sydney to Newcastle. What the northern range is can only be ascertained by searching along the coast.

We have also "Blue Gum" (the latter not seen in fruit, but apparently the same species), *Woolls*. (B.Fl. iii, 229, under *E. botryoides*). I both spoke and wrote to Dr. Woolls some years ago, and he assured me that what he sent to Mr. Bentham was *E. saligna*.

Then again we have, under *E. botryoides*, in B.Fl. iii, 229, "Var. with the ovary more conical in the centre, and the operculum shortly beaked, Paterson's River, "Blue Gum," *Herb. R. Brown*." This also is *E. saligna*.

Victoria.—Mueller in his "Key to the System of Victorian Plants," excludes *E. saligna* as a Victorian plant. He, however, includes *E. botryoides*, "finally tall, bark persistent, dark, rough," and records it from the east (which includes Gippsland, but not alpine localities).

Dr. A. W. Howitt wrote some years ago to me:—"Gippsland Mahogany," *Eucalyptus botryoides*. Locally it seems to be well thought of. It is confined to certain localities near the coast of East Gippsland, not extending in the mainland west of the mouth of the Mitchell River, but in the sandy tracts between the lakes and the sea, at least as far as Seacombe. In this part, however, as also generally in the sandy coast-land, the timber is small. Timber of size for milling purposes grows, I think, only about the Snowy River."

The Victorian specimens in the National Herbarium, Sydney, all belong to *E. botryoides*.

Metung (A. W. Howitt). I may mention that juvenile leaves from this locality, collected by Mr. Howitt, precisely resemble those of typical *E. saligna* from Brisbane Water.

"Sea-coast at Lake King. Dr. F. Müller." (*E. botryoides* in Bentham's handwriting.)

"Mahogany tree of Snowy River" (W. H. Harvey, ex Herb. Hook.).

E. Gippsland (E. E. Pescott through C. Walter).

(*Proc. Linn. Soc. N.S.W.*, xxx, 502–509 [1905].)

2. With *E. robusta* Sm.

Already referred to under *E. robusta*, p. 49.

DESCRIPTION.

CXXVII. E. saligna Smith.

In *Trans. Linn. Soc.* iii, 285 (1797).

FOLLOWING is the original description :—

Operculo conico acuto calyceque anguloso subancipiti, capitulis lateralibus solitariis, fructu turbinato, foliis lineari-lanceolatis.

The leaves are narrower and less coriaceous than in most of the species. The little heads of flowers grown on shortish flower stalks, one from the bosom of each leaf. The flowers are smaller than in any of the others, their covers acute, the length of the calyx. Fruit turbinate with a slightly curved margin, and crowned with the pyramidal permanent base of the style.

It was then described by Bentham, B.Fl. iii, 245, and subsequently by Mueller in the "Eucalyptographia." It was described in my "Forest Flora of New South Wales," i, 75. Much of what is therein stated as regards "Flooded Gum" refers to var. *pallidivalvis* Baker and Smith (see below). The variety *parviflora* Deane and Maiden, was subsequently described by me under the name *E. Deanei*.

I have given so ample an account of *E. saligna* in my "Forest Flora" that it seems unnecessary to repeat many of the details.

E. saligna is a smooth-barked species, with more or less rough, scaly, or sub-fibrous bark at the butt. Sometimes the trunk is practically smooth, forming a shaft, white in colour or with a bluish cast.

Its timber is red, and its erect and unhindered method of growth, the result of favourable vegetative conditions, produces timber remarkably uniform in character, and largely free from the interlocked and twisted characters which are frequently observed in its congeners, particularly those which grow in poor soils and exposed situations.

It is impossible to exhaustively study *E. saligna* apart from *E. botryoides*, and therefore I venture to invite my readers' attention to the comparative statement concerning them given above (p. 52).

RANGE.

This is a tree of the coastal belt and gullies of the tablelands, both of New South Wales and Queensland. I do not know of its occurrence further south than Bateman's Bay. Its range in Queensland requires investigation.

A favourite situation is in moist flats, or in brushy gullies, being often the only species of Eucalyptus in such situations. When growing in the bottom of narrow gullies, with plenty of alluvium and moisture it shoots up towards the light, and attains a great height and diameter of trunk.

The canopy is not great, and the clean stem looks a striking object amidst the surrounding umbrageous foliage at its base. Sometimes it ascends the sides of the gully, or the sides of hills, but it never attains its best development away from shelter.

New South Wales.

Southern Localities.—"Woolly Butt," native name "Mudione," height of tree 130 feet, diameter 2 feet 6 inches; Nelligen (Forester J. S. Allan). It is not found in workable sizes further south than Currawang, Nelligen. Slope of Barrengarry Mountain towards Kangaroo Valley (J.H.M.); Mount Keira (A. G. Hamilton).

Port Jackson District, e.g., Spit Road, near Mosman (connecting with *E. botryoides*); North Shore Line and Lane Cove; Burwood; Gladesville; Field of Mars; Parramatta.

Northern Localities.—"Blue Gum," Gosford (A. Murphy); "Blue Gum," Wyong (C. T. Musson); "Blue Gum," Blue Gum Flat or Ourimbah (J. L. Boorman).

"Blue Gum," Booral-Gloucester (A. Rudder); Stroud (A. Rudder), somewhat glaucous.

"Blue Gum," Failford to Forster (J.H.M.), somewhat glaucous; "Blue Gum," Port Macquarie district (G. R. Brown); Wauchope (A. Langley). A little glaucous.

Moona Plains, Walcha (A. R. Crawford).

Dorrigo (W. Heron).

"White Gum." Large white tree to 14 feet girth, and 60 feet barrel. Bark clean to within about 3 feet from the ground. Growing in steep falls to Barnard Gully, Parish Vant, County Hawes (M. H. Simon); transit to *E. Deanei.*

Styx River, Armidale district (A. W. Howitt); Hartley's Mill, near Glen Innes (H. Deane).

Murwillumbah (R. A. Campbell); Mount Warning (W. Forsyth); Foot of Mt. Lindsay, Macpherson Range. Very exserted valves (W. Forsyth); Acacia Creek, Macpherson Range (W. Dunn).

Queensland.

Macpherson Range (J.H.M.); Brisbane (J. L. Boorman); Eumundi (F. M. Bailey); Vicinity of Blackbutt Range (R. N. Jolly).

AFFINITY.

1. With *E. botryoides* Sm. Already dealt with.

Variety.

Var. *pallidivalvis* Baker and Smith, "Research on the Eucalypts," p. 32 (1902).

Following is the original description :—

The herbarium material of this tree is altogether much coarser than that of the type.

The leaves are large and broad, and generally dry a fresh, green colour, with a whiteness near the midrib, and a pale under-surface. Branchlets angled. Peduncles flattened, about 6 lines long, bearing generally over six flowers, pedicel 4 lines long. Calyx 2 lines in diameter, tapering into the pedicel. Operculum hemispherical, acuminate.

Fruit uniformly pear-shaped, on a short, thick pedicel, or sessile, *glaucous*, about 3 lines in diameter, sometimes angled, rim thin, capsule sunk ; valves exserted, obtuse, white.

Habitat.—Narara, Murwillumbah, Booral, Gosford, Bulahdelah, Tumbulgum, Barber's Creek, Lismore, New South Wales.

"Flooded Gum" is often called "Blue Gum" by experienced people, while normal *E. saligna* is often more or less glaucous. The fruits have often a slightly urceolate shape, and sharp, inflexed valve-tips. As a rule, though not invariably so, the buds and fruits are slightly larger than those of the normal form.

SYNONYMS.

1. *E. grandis* Hill.

2. I received specimens of it from the distinguished French firm Vilmorin, Andrieux & Co., of Paris, some years ago under the name *E.* ....., but as I cannot trace the name in literature, I do not publish it. The specimens were quite normal. It is also cultivated in Algeria and Java.

1. Following is Mr. Walter Hill's imperfect description of his *E. grandis* in the "Catalogue of the Timbers of Queensland" prepared for the London International Exhibition of 1862 :—

Eucalyptus grandis Hill, Myrtaceæ, Flooded Gum. (Diameter) 40-60 (inches), (height) 90-140 (feet).

A majestic tree, inhabiting the rich alluvial flats upon the banks of rivers, and in such has a pillar-like trunk, clear of branches for three-fourths of its entire height. The timber is in high repute for strength, lightness (it floats in water when dry), and durability, and can be had in great quantities.

See also :—

Flooded Gum (*Eucalyptus grandis*) native name "Toolur." Grows in bush on basalt, or on the edges of scrubs. It has a white bark which peels off right down to the ground. It grows to a great height, and is the lightest of all the gums hereabout (South Queensland), floating in water soon after being cut. It is easily cut by saw, but shrinks very much in drying. It is used for weatherboards, and sometimes for making parts of drays and carts. Also used for masts, spars, and planks of vessels. (W. Pettigrew in *Proc. Queensland Philos. Soc.* 1877 [1878].)

Mr. Pettigrew acknowledges his indebtednesss to Mr. Walter Hill, who was then Director of the Botanic Gardens, Brisbane.

E. grandis Hill is referred to in my *Forest Flora of New South Wales* i, 79, and, although not formally described, is to be found in the Kew Herbarium and some other herbaria, and, in the light of later knowledge, the informal description of Mr. Walter Hill, as there quoted, is quite clear, and, since it is backed up with herbarium specimens, might be claimed to be sufficient, if it were desired to give it specific rank.

RANGE.

It is found in coastal New South Wales and the southern tableland, from Barber's Creek northwards to south-eastern Queensland. As it is not yet well understood as a distinct variety, its range should be further enquired into.

New South Wales.

George Caley, who botanised in New South Wales on behalf of Sir Joseph Banks from 1800 to 1810, collected this form, and he did not explore more than a hundred miles from Sydney to the south, and probably less to the north. He stated the native name to be "Calangara."

It is represented in the National Herbarium, Sydney, from the following localities:—"Flooded Gum," Booral district (A. Rudder); Port Stephens (Miss Connolly); "Flooded Gum," Failford to Forster (J.H.M.); Port Macquarie (G. R. Brown), as "Blue Gum"; Coff's Harbour (J. L. Boorman), as "Blue Gum"; Moonee, Woolgoolga (E. H. F. Swain), as "Blue Gum"; "A gum, purple bark, shaggy base, on poor soil," Woolgoolga (E. H. F. Swain); Alstonville, Lismore, and Ballina (W. Baeuerlen); Richmond River (C. Fawcett); Mullumbimby (W. Baeuerlen).

Queensland.

"Flooded Gum," creeks north of Macpherson Range (R. N. Jolly); Maroochie (F. M. Bailey); Beech Mountain, near Canungera; also Tambourine Mountain (J. Shirley); "Flooded Gum," Landsborough (P. MacMahon), in leaf only.

Explanation of Plates 97–100.

PLATE 97.

E. robusta Sm.

1. Portion of figure of type labelled "*Eucalyptus robusta*, Brown Gum Tree or New Holland Mahogany" in Smith's "Botany of New Holland, &c." (1793).
2. Portion of figure of Cavanilles "*Eucalyptus rostratus*," taken from his "Icones," iv, tab. 342.

3*a*. Leaf; 3*b*, buds of a specimen labelled in Allan Cunningham's handwriting "*Eucalyptus robusta* variety *rostrata*." It is in every way normal *robusta*.

4*a*. Juvenile leaf; 4*b*, front and back views of anther. Bondi, Sydney. (J.H.M.)

5. Buds with long operculum. Kurnell, Botany Bay, near Sydney.

6*a*. Large thick mature leaf; 6*b*, large buds; 6*c*, urceolate fruits. Kogarah, near Sydney. (J. H. Camfield.)

PLATE 98.

E. robusta Sm. (1–9).

1. Very immature fruits, urceolate, and with remarkably long peduncle.
2. Immature fruits, urceolate, and with marked rims. Kogarah, Sydney. (J. H. Camfield.)
3. Nearly sessile fruits. Narrawallee, Milton, N.S.W. (R. H. Cambage.)
4. Fruits, showing well-marked rim. Port Stephens, N.S.W. (J. L. Boorman.)
5. Fruits small, and valves well exserted. Stradbroke Island, near Brisbane, Queensland. (F. M. Bailey.)
6. Fruits smaller than normal, and valves not exserted (the fruits are glaucous). Byron Bay, N.S.W. (J.H.M. and J. L. Boorman.)

7*a*. Buds; 7*b*, fruits; 7*c*, deeply sunk capsule, looking from top. These specimens are abnormal, and may show hybridism between *E. robusta* and *E. botryoides*.

8*a*. Very small buds; 8*b*, small fruits, sessile, cylindrical, and angled. The buds are small, but otherwise normal, but the fruits are very different from those of normal *robusta*, and show transit to *botryoides*.

9. Remarkably narrow leaf, even narrower than that shown of the type (Fig. 1, Plate 97), which is the narrowest leaf on the original figure. As a matter of fact, the average *robusta* leaf is not narrower than Fig. 3*a* of Plate 97. Rose Bay, Sydney. (R. Helms.)

E. botryoides Sm. (10–12).

10*a*. Leaf with buds; 10*b*, fruits, both forming a portion of Cavanilles' drawing of *Eucalyptus platypodos* in his "Icones," iv, tab. 341. This is not a figure of the type, but it precisely matches the type.

11*a*, 11*b*, 11*c*. Seedling leaves, showing variation in size and shape, "Snowy River Mahogany." Lake Tyers, Victoria. (H. Hopkins.)

12. Intermediate leaf. Metung, Victoria. (A. W. Howitt.)

PLATE 99.

E. botryoides Sm. (1–10).

1. Juvenile leaf. Otford, near Sydney. (R. H. Cambage and J.H.M.)
2. Unusually broad mature leaf. Burrill, Milton, N.S.W. (R. H. Cambage.)

3*a*. Normal mature leaf and buds, which are almost urceolate; 3*b*, buds with double operculum; 3*c*, fruits. Rockdale, near Sydney. (J. H. Camfield.)

4*a*. Buds with hemispherical operculum, calyx-tube angled, and in some specimens almost winged; 4*b*, 4*c*, side and back views of anther. Manly, near Sydney. (Rev. Dr. Woolls.)

5*a*. Buds, with conical opercula (showing some transit to those of *E. robusta*); 5*b*, anther; 5*c*, fruits. Kurnell, Botany Bay, Sydney. (J. L. Boorman.)

6. Fruits, the valves slightly exsert. Mrs. Macquarie's Chair, Outer Domain, Sydney. (J.H.M.)
7. Fruits, the valves exsert. Conjola, Milton, N.S.W. (W. Heron.) In 6 and 7 note the Maltese Cross arrangement of the tips of the capsules, seen also in *E. saligna* and *E. robusta*.
8. Very small fruits. Jervis Bay, N.S.W. (J.H.M.)
9. Fruits larger than normal. Otford, near Sydney. (J. H. Camfield.)
10. Buds of an imperfect specimen, showing transit to *E. saligna*. Glasshouse Mountains, Queensland. (Dr. J. Shirley.)

E. saligna Sm. (11–16).

11*a*. Juvenile leaf; 11*b*, intermediate leaf; 11*c*, mature leaf; 11*d*, buds and flowers; 11*e*, 11*f*, front and back views of anthers; 11*g*, 11*h*, fruits varying in size (from the same twig). Blue Gum Flat (Ourimbah), near Gosford, N.S.W. (No specimen of Smith's type appears to be extant, and I have assumed the above to be typical. The figures are taken from a fine tree of the ordinary New South Wales or Sydney Blue Gum from a classical locality for the timber for nearly a century. They precisely match specimens collected in the Port Jackson district.)

12. Fruits immature. Parramatta Park. (O. D. Evans.)
13. Fruits. Chatswood, North of Sydney. (R. D. Hay.)
14. Immature fruits, angled by compression, and sessile. Burwood, Sydney. (J.H.M.)
15. Small, sessile fruits. Lane Cove River, Sydney. (J. H. Camfield.)
16. Buds, not so sessile as those in the assumed type. Burwood, Sydney. (Rev. Dr. Woolls.)

PLATE 100.

E. saligna Sm. (1–7).

1. Conoid fruits, "Blue Gum." Booral, N.S.W. (A. Rudder.) This is a puzzling transition form between the normal and var. *pallidivalvis*.

2*a*. Buds (reminiscent of those of *E. botryoides*) ; 2*b*, fruits. Barrengarry Mountain, 5 miles from Kangaroo Valley township, N.S.W. (R. H. Cambage and J.H.M.)

3*a*. Mature leaf ; 3*b*, small buds ; 3*c*, small fruits, with well exserted valves. Foot of Mt. Lindsay, Macpherson Range, N.S.W. (W. Forsyth.) (Compare the form intermediate between *E. saligna* and *E. Deanei* Maiden, from Jilliby Jilliby, N.S.W.)

4*a*. Intermediate leaf ; 4*b*, mature leaf ; 4*c*, buds ; 4*d*, fruits. Acacia Creek, Macpherson Range. (W. Dunn.)

5*a*. Buds and flowers ; 5*b*, fruits, tips of valves almost awl-shaped. Moona Plains, Walcha, N.S.W. (A. R. Crawford.)

6*a*. Buds ; 6*b*, fruits, Spit Road, Mosman, Sydney. (W. Forsyth.) Thought to connect *E. botryoides* with *E. saligna*.

7*a*. Buds, with very pointed operculum ; 7*b*, small fruits. Walcha. (J. B. Croft.) Another northern form, with pointed buds and small shiny fruits. Connecting with *E. Deanei* Maiden.

E. saligna Sm., var. *pallidivalvis* Baker and Smith (8–13).

8. Intermediate leaf, "Flooded Gum." Richmond River, N.S.W. (A. W. Deane.) (I received foliage only.)

9*a* and 9*b*. Mature leaves ; 9*c*, buds ; 9*d* and 9*e*, fruits ; 9*f* and 9*g*, front and back views of anther. Booral, N.S.W. (A. Rudder.)

10. Short, thick sessile buds. Alstonville, N.S.W. (W. Baeuerlen.)

11*a*. Pedicellate buds ; 11*b*, small sessile fruits. Lismore, N.S.W. (W. Baeuerlen.)

12. Fruits. Note the slightly urceolate shape, the sharp inflexed valve tips, usually five, characteristic of this variety. Sydney district. (George Caley, 1800–10.)

13. Fruits. Moonee, Woolgoolga, N.S.W. (E. H. F. Swain.) Note urceolate shape. (The buds and fruits are usually glaucous.)

EUCALYPTUS ROBUSTA SM. [See Plate 98.]

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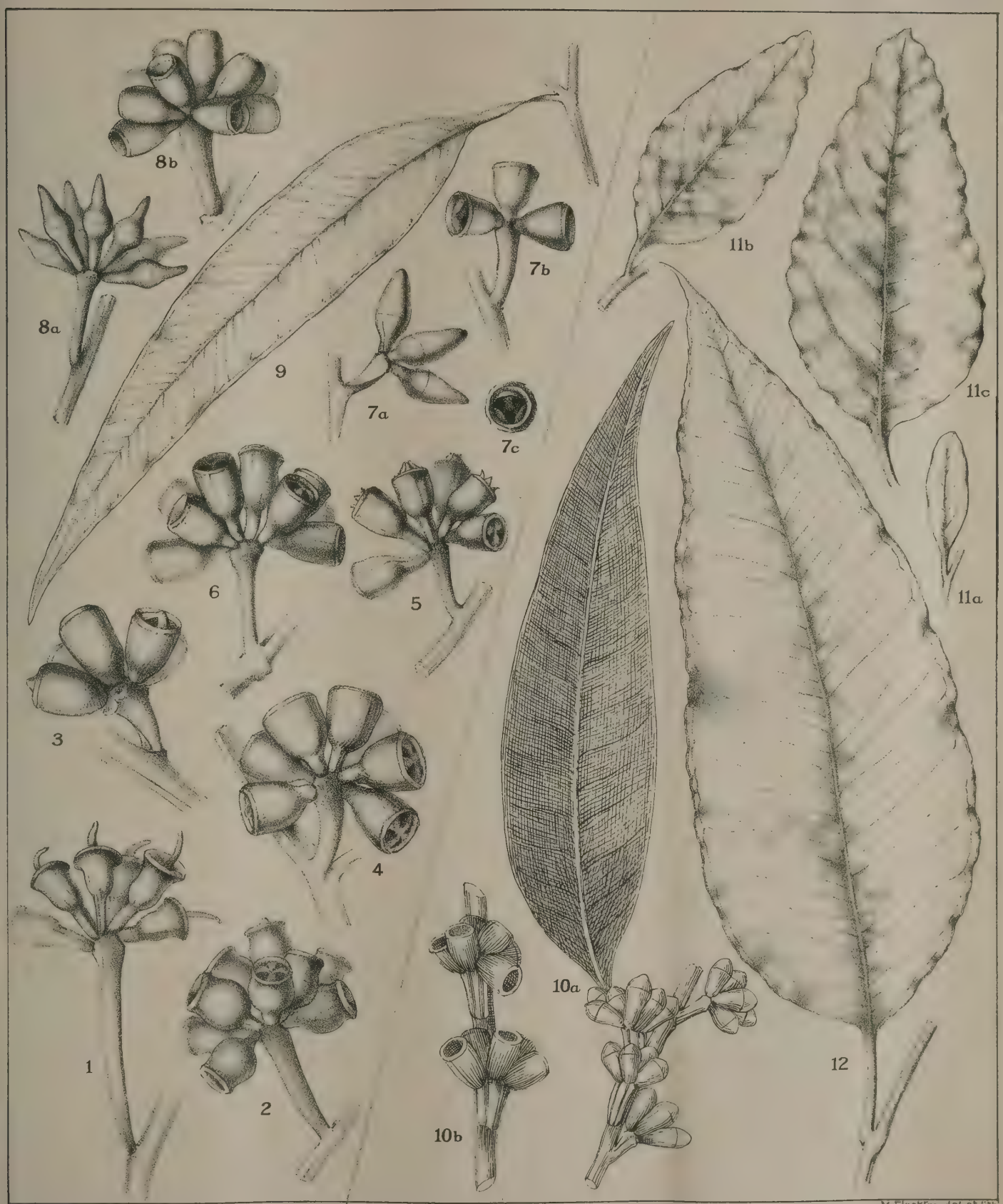

EUCALYPTUS ROBUSTA SM. (*1–9*). [See Plate 97.]

E. BOTRYOIDES SM. (*10–12*). [See Plate 99.]

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EUCALYPTUS BOTRYOIDES SM. (*1–10*). [See Plate 98.]

E. SALIGNA SM. (*11–16*). [See Plate 100.]

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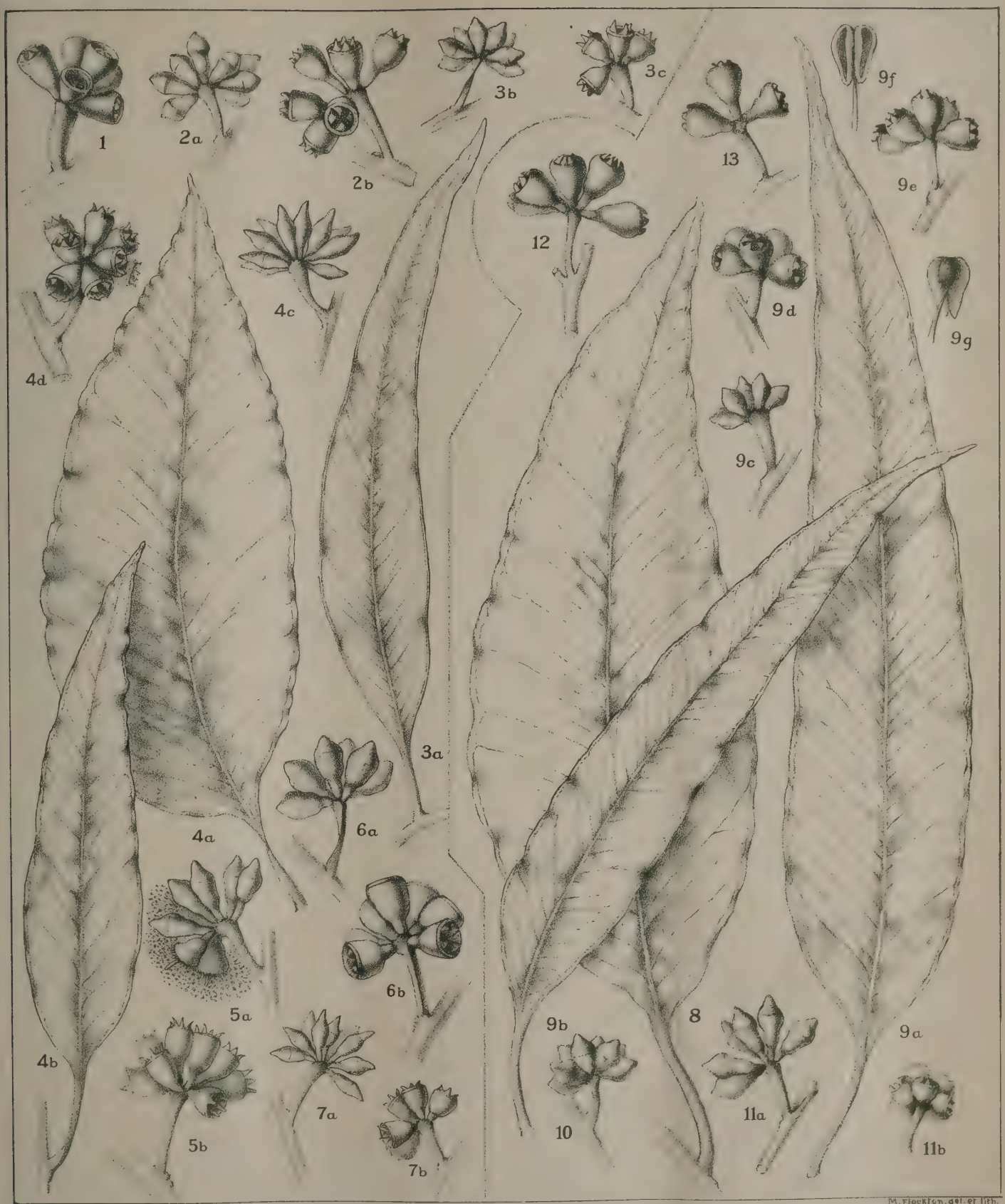

EUCALYPTUS SALIGNA SM. (*1–7*). [See Plate 99.]

E. SALIGNA SM. *var. pallidivalvis* BAKER AND SMITH (*8–13*).

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The following species of Eucalyptus are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets:—

acacioides, A. Cunn. (xlviii).
acmenioides, Schauer (xxxii).
amygdalina, Labill. (xvi).
Andrewsi, Maiden (xxi).
Baileyana, F.v.M. (xxxv).
Behriana, F.v.M. (xlvi).
bicolor, A. Cunn. (xliv).
Boormani, Deane and Maiden (xlv)
Bosistoana, F.v.M. (xliii).
Caleyi, Maiden (iv).
capitellata, Sm. (xxviii).
Consideniana, Maiden (xxxvi).
coriacea, A. Cunn. (xv).
corymbosa, Sm. (xii).
crebra, F.v.M. (liii)
dives, Schauer (xix).
fruticetorum, F.v.M. (xlii).
gigantea, Hook. f. (li).
goniocalyx, F.v.M. (v).
hæmastoma, Sm. (xxxvii).
hemiphloia, F.v.M. (vi).
longifolia, Link and Otto (ii).
Luehmanniana, F.v.M. (xxvi).
macrorrhyncha, F.v.M. (xxvii).
maculata, Hook. (vii).
melanophloia, F.v.M. (liv).
melliodora, A. Cunn. (ix).
microcorys, F.v.M. (xxxviii).
microtheca, F.v.M. (lii).
numerosa, Maiden (xvii).
obliqua, L'Hérit. (xxii).
ochrophloia, F.v.M. (l).
odorata, Behr and Schlechtendal (xli).
paniculata, Sm. (viii).
pilularis, Sm. (xxxi).
piperita, Sm. (xxxiii).
Planchoniana, F.v.M. (xxiv).
populifolia, Hook. (xlvii).
punctata, DC. (x).
regnans, F.v.M. (xviii).
resinifera, Sm. (iii).
saligna, Sm. (iv).
siderophloia, Benth. (xxxix).
sideroxylon, A. Cunn. (xiii).
Sieberiana, F.v.M. (xxxiv).
stellulata, Sieb. (xiv).
tereticornis, Sm. (xi).
virgata, Sieb. (xxv).
vitrea, R. T. Baker (xxiii).

* Government Printer, Sydney. 4to. Price 1s. per part (10s. per 12 parts); each part containing 4 plates and other illustrations.

Sydney: William Applegate Gullick, Government Printer.—1910.

A Critical Revision of the Genus Eucalyptus

BY

J. H. MAIDEN

(Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney)

Vol. III. Part 4.

Part XXIV of the Complete Work.

(WITH FOUR PLATES.)

"Ages are spent in collecting materials, ages more in separating and combining them. Even when a system has been formed, there is still something to add, to alter, or to reject. Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages. In these pursuits, therefore, the first speculators lie under great disadvantages, and, even when they fail, are entitled to praise."

MACAULAY'S "ESSAY ON MILTON."

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DESCRIPTION.

CXXVIII. E. Deanei Maiden.

In *Proc. Linn. Soc. N.S.W.*, xxix, 471 (1904).

It may be described as follows :—

A very large tree, with smooth and sometimes almost glaucous bark, a little ribbony at the butt Some trees resemble Blue or Flooded Gum (*E. saligna*) a good deal. In other cases (northern New England) it forms a gnarled tree up to 7 or 8* feet in diameter as seen, the scrambling branches in some cases actually touching the ground. Such trees remind one of *Angophora lanceolata.*

The gnarled trees have buttresses spreading over a large area of land, and have thin scaly or ribbony bark extending a good distance up the trunk ; in others, the roughish bark extends but a short distance. The trunk and branches show patches of bluish, purplish, or reddish. The rhachises are often red, so are the midribs and margins. Timber red.

On the lower Blue Mountains it goes under the name of Broad-leaved Blue Gum. In New England it bears the local name of Silky Gum, owing to the sheen of its bark. It is also called White Gum and Blue Gum. It is also known in the Glen Innes and Tenterfield districts as Brown Gum.

Juvenile leaves.—Broadly lanceolate to nearly ovate and orbicular, petiolate, acuminate, intramarginal vein at some distance from the edge, lateral veins roughly pinnate, and making an angle of about forty-five degrees with the midrib.

Mature leaves.—Lanceolate to broadly lanceolate, acuminate, slightly falcate, upper surface slightly shiny, lower surface dull ; intramarginal vein not far removed from the edge ; the lateral veins fine, numerous, and nearly pinnate.

The tree is what bushmen recognise as a Broad-leaved Gum in comparison with other species The young foliage is especially broad, shining, particularly on the upper surface, and bears some superficial resemblance to pear foliage.

Buds.—Each umbel on a peduncle of about 1 cm., and consisting of four to nine buds each, with pedicels of about ·5 cm. Buds clavate and about ·5 cm. long, calyx tube slightly urceolate, and tapering abruptly into the pedicel. The operculum hemispherical, with an umbo, and about half the length of the calyx tube.

Flowers.—Filaments cream coloured, the anthers open in parallel slits, and have a small gland at the back. The filament is attached about the middle, and the anther is versatile.

Fruits.—Small, under ·5 cm., cylindroid or rarely conoid, slightly urceolate, rim flat, tips of the valves exsert. (Type from The Valley, near Springwood, N.S.W.)

Named in honour of my old friend, Mr. Henry Deane, for many years Engineer-in-Chief for Railway Construction, New South Wales, my coadjutor in work on the genus for many years, and still my valued friend, although his official duties rendered it necessary to discontinue the partnership.

RANGE.

So far as is known at present, it is confined to eastern New South Wales—the coastal area, coastal mountains and table-lands ; it extends a short distance into Queensland (northern New England). Its southern limit known at present is about Mittagong. It attains its greatest abundance and development in the northern districts of New South Wales, chiefly New England and eastern slopes.

* Plenty of trees in the Ourimbah district reach 10 or 12 feet in diameter. (A. Murphy.)

Southern Localities.—Blue Gum Creek, Picton Lakes, also "Flooded Gum," Burragorang (R. H. Cambage); "Red Gum," Hill Top (E. Cheel).

Western Localities.—Wallerawang (J.H.M.); Mt. Wilson (Jesse Gregson); Jamieson Valley (W. Forsyth); Valley Heights (H. Deane and J.H.M.); Springwood (J.H.M.); Gully near Bent's Basin (W. Woolls).

Northern Localities.—"Round-leaf Blue Gum," 10–12 feet in diameter, Ourimbah (A. Murphy); Jilliby Jilliby, *via* Wyong (J. L. Boorman); "Green Gum," "Blue Gum," with very pointed opercula, Walcha (J. B. Croft); Torrington (J. L. Boorman); East of Glen Innes (R. H. Cambage); Bald Knob, 26 miles from Glen Innes on Grafton road (J. L. Boorman); "Brown Gum," Glen Innes to Tenterfield (Forester Stopford); Tenterfield to Sandy Flat, also near Red Soil Creek, Mt. Spiraby (J.H.M.); "Silky Gum," Bluff River, near Tenterfield (H. Deane); "White Gum," large wide pendulous trees, very handsome, bark ribbony at base, stem clean, Boonoo Boonoo (J. L. Boorman); Wilson's Downfall, Undercliffe; it chooses especially the moist eastern edge of the plateau proper, on granite soil (E. C. Andrews); Acacia Creek, Macpherson Range (W. Dunn).

QUEENSLAND.

Thulimbah, Stanthorpe district (Rev. J. H. Simmonds); "a very large tree, soft timber, thick sap, thick bark" (A. Murphy, J. L. Boorman).

Hybridism.

I have specimens from Jilliby Jilliby, near Wyong (J. L. Boorman), which are intermediate in character between this species and *E. saligna* Sm., and may indicate hybridism.

AFFINITIES.

With *E. saligna* Sm.

Its closest affinity appears to be with this species; indeed, it was for some years looked upon as a variety of it, but its generally larger size, its broader juvenile foliage, its dense massy crowns, which remind one of a laurel, more spreading in habit than *E. saligna*, its smaller buds and fruits, slightly different in shape, sufficiently characterise it.

DESCRIPTION.

CXXIX. E. Dunnii Maiden.

In *Proc. Linn. Soc. N.S.W.*, xxx, 336 (1905).

A LARGE White Gum, much resembling the Blue Gum (*E. saligna*) when growing (W. Dunn), therefore an erect grower.

Bark.—Rough, flaky or more or less corky at the butt, and for a varying distance up the stem; thenceforward the bark hangs in ribbons. "The rough bark or ribbons follow the tree up to the topmost branches, and the tree always carries more of it than does *E. saligna*" (W. Dunn).

Timber.—White throughout, from the sap to the heart, somewhat coarse-grained and fissile. Apparently a tough wood. Stress is laid on the quality of this timber, as the name White Gum usually indicates timber of poor quality.

Juvenile foliage.—Nearly cordate to broadly lanceolate, often up to 4 inches long and 2 inches wide, while still in the opposite stage; petioles thin, and usually from $\frac{1}{2}$ to $\frac{3}{4}$ inch. Texture thin, undulate. Bright green, paler on the underside; oil-dots abundant, the midrib conspicuous (particularly on the underside), the primary veins roughly parallel, and at an angle of about 45 degrees with the midrib; intramarginal vein at some distance from the edge.

Mature foliage.—Lanceolate leaves with petioles of an inch and more; 6 inches and more in length, with a usual breadth at the widest part of 1 to $1\frac{1}{4}$ inches. Of medium texture; oil-dots abundant. Midrib very conspicuous (white); penniveined; intramarginal vein well removed from the edge. The mature leaves resemble those of the well-known *E. tereticornis* a good deal. Twigs often angular.

Buds.—Symmetrical in shape, the operculum conical, and the calyx of similar size and shape, tapering into the rather short pedicel.

Flowers.—Rather small; usually 3 to 5 in the umbel; anthers with parallel cells.

Fruits.—Hemispherical, barely $\frac{1}{4}$ inch in diameter, abruptly tapering into a pedicel of the same length. Peduncle of about $\frac{1}{2}$ inch. Rim narrow and rather sharp, valves well exserted and mostly 4 in the specimens seen.

The species is named in honour of William Dunn, Forest Guard, Acacia Creek, who first sent it, and who has assiduously collected the forest flora of his district.

RANGE.

Acacia Creek, Macpherson Range, New South Wales side. Extends into Queensland territory, "but I do not believe it is found north of the Condamine River" (William Dunn). The name of "Macpherson Range White Gum" has been suggested for it

"As a rule it is found on the lower lands, on rich volcanic soil, along the banks of water-courses and the like. There is a good deal in the Macpherson Range district, but I do not know any other district where it grows" (W Dunn).

It is desirable that additional localities for this species be ascertained.

AFFINITIES.

1. With *E. Deanei* Maiden.

Its closest affinity would appear to be with *E. Deanei* Maiden. The juvenile foliage of the two species is often remarkably similar in texture, shape, and apparently many other respects. The valves of the fruits of *E. Deanei* are not exserted, or but slightly so, while the timbers are sharply different, that of *E. Deanei* being red.

2. With *E. saligna* Sm.

Some resemblances and differences have been already referred to. Plate 101 may also be compared with Plates 99 and 100 (*E. saligna*). The timbers of the two species sharply separate them, that of *E. Dunnii* being white.

3. With *E. propinqua* Deane and Maiden.

E. propinqua Deane and Maiden, is a species with which it might be confused with herbarium specimens alone (the bark of *E. propinqua* is grey and patchy, and the timber red).

The leaves of *E. propinqua* have finer and more parallel veins; but in buds, flowers and fruits the resemblance of the two species is sufficiently close to necessitate caution.

DESCRIPTION.

CXXX. E. Stuartiana F.v.M.

As described in a modified manner by Mueller in his "Eucalyptographia," Part iv (1880).

It may be described as follows:—

A large, often scrambling tree, with soft, white (often superficially discoloured) box-like bark, rough to the extremities of the branchlets. Bark thickish, often zigzagged or wrinkled, and reminding one of the shorn back of a sheep.

Timber pale-coloured (sometimes flesh coloured when fresh), soft, brittle, and lacking in durability.

Juvenile leaves.—Glaucous, nearly orbicular, or with a blunt apex, sessile, stem-clasping. Intramarginal vein well removed from the edge, lateral veins roughly pinnate.

Mature leaves.—Lanceolate, equally green on both sides, petiolate (petiole often markedly twisted), intramarginal vein well removed from the edge, lateral veins roughly pinnate. Leaves sometimes very long, approximating those of *E. globulus* in size.

Buds.—Four to seven in number on short pedicels on a common peduncle of about ·5 cm. The operculum shortly rostrate and equal in length to the calyx-tube which abruptly tapers into the pedicel.

Flowers.—The anthers open in parallel slits, and have a small gland at the back. The filament is attached at about the middle and the anther is versatile.

Fruits.—Nearly hemispherical, about ·7 cm. in diameter, with a well defined slightly domed rim, the valves markedly protruding from the orifice.

In honour of Charles Stuart (1802–1877), an educated man, who collected Tasmanian sea-weeds for Harvey, and miscellaneous plants extensively for Mueller in Tasmania and New South Wales (chiefly in New England). Many species were named after him. For details of his botanical work see my notes on Australian Botanists—(a) General, (b) New South Wales in *Journ. and Proc. Roy. Soc. N.S.W.*, xlii, p. 124 (1908), and Tasmanian Botanists in *Proc. Roy. Soc. Tasmania*, 1909, p. 28.

This is but one of many species in regard to which there has been much confusion in the synonymy. It would perhaps be an advantage if the name of *E. Stuartiana* F.v.M., could be blotted out from the list of Eucalypts, but such a step would be impossible; and the wisest course has for many years seemed to me to restrict it to the widely diffused "Apple" of New South Wales, Northern Victoria, and Southern Queensland.

It seems an unnecessary addition to an already over-burdened synonymy to describe the species under another name.

Amongst those forms labelled "*E. Stuartiana* F.v.M." by Mueller, this is the most widely diffused; it was so named by Mueller more frequently than any other form, and adoption of the name would involve a minimum of disturbance of botanical nomenclature.

Its commonest name in New South Wales and North-eastern Victoria is "Apple," but it must not be confused with *Angophora*. It is the "But-But" of Gippsland, as pointed out by Mr. Howitt, a designation that separates it from *E. cinerea*.

It is sometimes called "Woolly Butt," but must not be confused with *E. longifolia*.

It is the "Apple-tree Gum" of Mr. De Coque (*Journ. Roy. Soc. N.S.W.*, xxviii, 212, 1894).

Owing to the "Box" (*E. hemiphloia*) appearance of the bark, it has for many years been looked upon as a Box in some districts, though an inferior one.

Called "White Peppermint" in New England, in contradistinction to "Black Peppermint" (*E. cinerea* var. *nova-anglica*).

SYNONYMS.

1. *E. Stuartiana* F.v.M., B.Fl. iii, 244 (*partim*).

2. *E. Stuartiana* F.v.M. Eucalyptographia (*partim*), excluding in both cases the references to the "Red Gum" of Tasmania and to the "Peppermint" of Victoria.

3. *E. Bridgesiana* R. T. Baker, Proc. Linn. Soc. N.S.W., xxiii, 164 (1898).

4. *E. Stuartiana* F.v.M., var. *parviflora* Deane and Maiden, *ib.* xxv, 109, 1900.

5. *E. angophoroides* R. T. Baker, *ib.* xxv, 676, 1900.

6. *E. perfoliata* A. Cunn.

1 and 2. In Part XXI (Vol. III, Part I), pp. 4 and 6, of the present work, I have explained that there are three *E. Stuartianas* F.v.M., in botanical literature, and that the present name is the third of the series.

3. The description of this species under another name does not remove the difficulties which have gathered around the name *E. Stuartiana*.

4 and 5. It seemed to me desirable to indicate, by some name, a small-fruited form of *E. Stuartiana* which has been found near Hassan's Walls, at Young, and in several other parts of the State.

With the collection of additional material I found that the transition to the normal species was complete, and I do not think it is a useful variety. Shortly afterwards, Mr. Baker described this small fruiting form as *E. angophoroides*.

6. Allan Cunningham's Journal (p. 169), under date 11th April, 1817, contains the following entry:—

"*Eucalyptus perfoliata* of Kew Gardens is very frequent, and another species (*E. dives* Schauer.—J.H.M.), with cordate, sessile leaves, and others lanceolate and

inserted on a petiole" (Mt. York and near Vale of Clwydd). Again, under date 15th August, 1817, nearing Bathurst from the west, he says, "The *E. perfoliata* of the Vale of Clwydd is very common."

Variety *grossa*, var. nov.

Notwithstanding my previous experience with var. *parviflora*, the following form, proposed to be named *grossa* because of its very large juvenile foliage and larger fruits, seems to be worthy of record. With nearly normal *Stuartiana* all round, it still seemed distinct, and the following notes were made by me in front of it in June, 1906, when it was collected by Mr. J. L. Boorman and myself.

It occurs, say, 2 miles from Hanging Rock (on the Nundle Road), and by the side of the faint track along the top of the ridge.

A poor tree of 1 foot in diameter, scaly box-like (*Stuartiana*-like) bark, with smoothish or rather ribbony branches.

It goes up to a stem, but the erect stems have been destroyed by fire, leaving pendulous and even nearly horizontal branches.

Timber white, gum-veined, brittle, apparently quite like *Stuartiana*. Juvenile leaves broad, nearly orbicular, some glaucous. Also leaves in the intermediate (lanceolate) stage, still opposite and bearing buds in the axils.

Leaves (mature) pendulous, shiny, thickish. Fruits conoid.

The following appear to belong to this form :—

1. Peppermint, Nundle F. R. 1541, Parish of Nundle, County Parry, 40 feet. Rough bark to top (M. H. Simon).
2. Peppermint. Tree of 30 feet, 2 feet diameter, crooked, growing in swampy soil, and regarded as useless. Parish Royinn, County Parry (E. H. F. Swain).
3. White Peppermint. Walcha and Walcha Road, trees with a persistent semi-fibrous bark (J. F. Campbell).

RANGE.

The species occurs from north-eastern Victoria to south-eastern Queensland. In New South Wales it extends along the tablelands from end to end of the State.

Some of the localities given in the "Flora Australiensis" and "Eucalyptographia," belong to other species, as has already been indicated.

VICTORIA.

The following six Gippsland localities are by the late Dr. A. W. Howitt, who kindly favoured me with specimens. They are all his "Apple-tree or But But" :—

Castle Burn Creek, Crooked River Road; Stratford; Toongabbie; Lily's Leaf; Four Mile Creek, Port Road; and Dargo.

The following are some additional Victorian localities :—

Moyston (D. Sullivan); Ovens River, Timber No. 125, 1861; Bright District (J.H.M.); Hume River (Jephcott).

The following two statements embody Dr. Howitt's views of the "But But" of Victoria. I consulted him in the matter :—

This species is well marked, and is one of the most persistent in character of any of the Eucalypts of Gippsland. Wherever I have seen it I have found it to be a tree with somewhat large and spreading limbs, with a scaly, wrinkled bark, which is persistent up to the small branches.

The wood of this tree is valueless for splitting, sawing, and even for fuel. Its general appearance has caused it to be confused with *E. hemiphloia*, under the name of "White Box."—(*Trans. Roy. Soc. Vict.*, ii, 97.)

The next passage is from an unpublished official report by him :—

E. Stuartiana, the "Apple-tree" or "But But," grows to a great size in parts of Gippsland, and is also found in the north-eastern district. It is without exception the most worthless of Victorian Eucalypts, yet some years back I saw it cut for bridge building, and within the last five years I saw it cut for saw-mill purposes in Gippsland, under the name of "White Box." (A. W. Howitt.)

It is the Apple-tree of North Gippsland bushmen. Found generally throughout the low country of north and east Gippsland, on moderately good alluvial soil, but above the flooded areas. Moderate sized trees, with clean straight stems. Bark, "mealy rough," dirty grey colour, persistent on stems and large branches, and deciduous on smaller branches. In some parts of the district this tree attains a fairly large size, 3–4 feet in diameter, and 30–50 feet high to the first branch. Timber sound, not easily split, but sun-cracks badly in drying, pale in colour, not durable in the ground. Trees generally sound at heart, even in large specimens, but the timber, especially that from young trees, is more subject to the attack of wood-boring insects than most Eucalypts. (H. Hopkins.)

Bark on bole moderately rough-friable, or mealy-rough about the first 2 or 3 feet. All much rougher on old trees. Branches mostly more or less smooth, and smaller branches quite smooth or clean, the old bark peeling off in narrow strips, or long flakes. Wood very pale throughout, or slightly darker at heart. Dargo and near Buchan. (H. Hopkins.)

Lower Tambo River, also Metung to Boggy Creek. Underside of intermediate foliage pale, glandular twigs. There are two forms of *Stuartiana* here, with different sized fruits. (J.H.M.)

Between Bright and Germantown. (J.H.M.)

New South Wales.

It is in this State that the species finds its greatest development. It is almost invariably known as "Apple," the exceptions known to me are indicated.

Southern Localities.—Mafra, near Dalgety; much contorted trees; butt inclining to massive; limbs stout, twisted, numerous; bark box-like and persistent; about 30 feet high, much broken by snow or winds (A. W. Howitt); Boloco, Dalgety, yielding manna and massive saccharine exudate (A. M. N. Rose); Gungableen (Gungarlin) Estate (Goldsbrough, Mort & Co.); "Apple Box," Tumberumba (T. H. Williams); Cooma (J. C. Martin); Colombo, Lyttleton (W. Baeuerlen); Cabbage Box," Nangutta (W. Baeuerlen); Tumut (E. Betche); "Lowland Apple, *E. Stuartiana* (in contradistinction to Mountain Apple, *E. elæophora*) is a much larger tree with a smaller leaf, and likes good soil, growing mostly on flats. Very useful when sawn timber is required. A large woolshed in

this district has all lowland apple flooring boards. It makes good gate-posts, having the property of lasting in the ground for years, but it will not split. Easily destroyed, and frequently dies out of its own accord. Both trees are much alike" (W. M. Nowland, L.S.). This is the most favourable account of the timber of *E. Stuartiana* known to me.

Albury (Dr. Andrews, J.H.M.); Cockatoo near Germanton (W. Forsyth); Queanbeyan (H. Deane); Bungendore and Braidwood (W. Baeuerlen); Lake George (W. Baeuerlen); Gundagai (R. H. Cambage); Cootamundra (W. D. Francis); "Soft Apple Tree," Temora to Morangarell (Rev. J. W. Dwyer); Young (W. W. Froggatt, J.H.M.).

50–80 feet high. Bark rough and hard on trunk and branches nearly up to top. Bark greyish and cracked all over like Box (*E. hemiphloia*). Branches spreading and drooping. Wood brittle, no good, even to burn. Trunk often rotten in centre. Flower buds mostly arranged in sevens. Yass (Rev. J. W. Dwyer).

Goulburn (H. Deane, J.H.M.); Wombeyan Caves, on the limestone (J.H.M.); Mittagong (Rev. Dr. Woolls).

Western Localities.—Lyndhurst (A. W. Howitt); Manildra, Mt. Macquarie near Carcoar (J. L. Boorman); Rockley (J. L. Boorman); foot of Bald Hills, Bathurst (J.H.M.); Bathurst to Sofala (R. H. Cambage, J.H.M.); Orange (W. S. Campbell, R. H. Cambage, J.H.M.); 50–60 feet, girth 3 to 6 feet, bark brown, rough and persistent, branches white, timber of no value, not even for firewood. Bowan Park near Cudal (W. F. Blakely); Molong (W. Campbell); Parkes (J.H.M.); Murga, between Cudal and Eugowra (H. Deane); Warne (A. Murphy). Large pendulous trees, hence called "Sally." Plentiful on the sides of gullies. Stuart Town (J. L. Boorman); Cox's River (R. H. Cambage and J.H.M.); Hartley Vale (Jesse Gregson); Wallerawang (J.H.M.); "Peppermint," Capertee (J. L. Boorman); Ilford (R. T. Baker); "Peppermint," Mudgee (H. Deane); Gulgong (J. L. Boorman and J.H.M.); "Apple" or "Peppermint," 40–50 feet. Upper Meroo, Mudgee district (J. L. Boorman); "Woollybutt," near head of the Castlereagh River (W. Forsyth); Coonabarabran (Dr. H. I. Jensen).

[The following specimens are small-fruited, or inclined to be so. They are var. *parviflora* (*E. angophoroides* R. T. Baker) but I am unable to keep them separate from the preceding specimens, although they have been selected with the greatest care to try and keep them separate.

"Apple Topped Box," Towrang. Type of *E. angophoroides* (R. T. Baker); "Pepperwood," near Hassan's Walls, Bowenfels, type of *E. Stuartiana* F.v.M. var. *parviflora* Maiden (J.H.M.); "Pepperwood or Apple-tree," Portland district, Sunny Corner and Rylstone (J. L. Boorman). Fairly plentiful on low-lying lands in company with *E. viminalis*. On rising ground, superseded by *E. elæophora*. Useless, even for firewood. Perth, Bathurst district (J. L. Boorman); King's Plains, Blayney (R. H. Cambage); Canoblas, Orange (J. L. Boorman and J.H.M.).]

Northern Localities.—"Peppermint," 2 feet diameter, 80 to 100 feet. Head of Warrah Creek (Jesse Gregson); Moonan Flats (J. L. Boorman, J.H.M.); "Peppermint," 4 feet diameter, 40 feet high. Parish Vernon, County Parry (M. H. Simon); Tingha (J. L. Boorman); Howell (J. L. Boorman, J.H.M.); 3 miles from Inverell on Howell–Tingha Road as soon as granite is reached. Takes the place of White Box (*E. hemiphloia* var. *albens*) on granite. Emmaville (J. L. Boorman).

"The 'White Peppermint' grows on many of the slaty ridges around Walcha (Silurian). It is not abundant, and is of no commercial value, although sometimes used for fencing in the absence of better material. The timber, which is pale red in colour when fresh, is soft and liable to decay; it is also liable to the ravages of the white ant. The tree grows to an average height of 40 feet, with an average girth of about 8 feet. It is often gnarled and stunted, and generally has the appearance of being elbowed out of existence by *E. eugenioides* with which it shares the ridges. The bark is semi-persistent and faintly regular throughout, shedding its waste material in a kind of whitish flaky dust." (J. F. Campbell, Walcha.)

"White Peppermint," Armidale district (A. E. Stopford); 30–40 feet. Box bark up to small branches. Wollomumbi River (A. W. Howitt); Tenterfield to Sandy Flat (J.H.M.); Drake-Tenterfield (A. G. Hagman); Timbarra (C. Stuart); "White Box," Cottesbrooke, near Tenterfield (J.H.M.).

QUEENSLAND.

"Peppermint," Stanthorpe (Rev. J. H. Simmonds, J. L. Boorman).

AFFINITIES.

1. With *E. cinerea* F.v.M. var. *multiflora* (see Part XXI, p. 4, of the present work).

The more closely these two species are studied, the more evident it becomes that they have many points in common. Mr. R. T. Baker, *Proc. Linn. Soc. N.S.W.*, xxv, 667, is of opinion that *E. Stuartiana* (*Bridgesiana*), whose bark yields an oil, differs in this respect from *E. cinerea* (formerly *Stuartiana*, partim). It should, however, be pointed out that Mr. C. Falck calls the latter tree "Turpentine tree," by reason of the fact that there is oil in the bark of that species also. Eucalyptographia, under *E. pulverulenta* (*cinerea*).

Plate 101 (*Stuartiana*) should be compared with Plate 89 (*cinerea* var. *multiflora*). The juvenile leaves of the two forms are not very dissimilar, but the leaves of the latter are often broader and shorter, while those of *E. Stuartiana* often

attain a length never reached in *E. cinerea*, while those of the former are thicker. The buds of *E. Stuartiana* are shorter and more rounded, while the fruits lack the domed character of those of *E. cinerea*.

2. With *E. Dunnii* Maiden.

This species is an erect grower and a Gum, in both respects differing from *E. Stuartiana*. The timber of the latter is far inferior to that of *E. Dunnii*. The juvenile leaves are different, and the fruits of *E. Dunnii* more urceolate. There is, however, a general resemblance as regards herbarium specimens, between the two species, which should be borne in mind.

3. With *E. elæophora* F.v.M.

The two species occur in different situations, *E. Stuartiana* preferring damp flats, and *E. elæophora* well-drained places, such as the sides and tops of hills. They often resemble each other a good deal in scrambling habit, bark and timber. Their juvenile foliage is, however, different, that of *E. Stuartiana* being more uniformly orbicular. The buds of the two species are different, those of *E. elæophora* being sessile, the operculum shorter than the calyx-tube, which is commonly angled, and often winged. The fruit of *E. elæophora* is usually larger, and cylindrical or truncate-ovate.

4. With *E. Banksii* Maiden.

Dealt with under *E. Banksii*, infra, p. 75.

5. With *E. quadrangulata* Deane and Maiden.

This will be referred to when that species is reached.

DESCRIPTION.

CXXXI. E. Banksii Maiden.

In *Proc. Linn. Soc. N.S.W.*, xxix, p. 774 (1904).

A VERY large tree up to 100 feet, reminding one of *E. goniocalyx* in habit. Quite glabrous or the twigs a little glaucous. It has clean stems without ribbons, and no rough bark. It is locally known as "Woolly-butt" because the bark is fuzzy to cut, and, for convenience, "Tenterfield Woolly-butt."

Bark.—Of a dull uniform grey; woolly or fuzzy. Not as soft and as Box-like as that of *E. Stuartiana*. Branches smooth, not ribbony. The uniformity of the smooth bark of this species (intermediate between that of a gum and a box, and somewhat resembling that of a Grey Gum, *E. punctata* or *E. propinqua*) is notable.

Timber.—A good hard timber, not soft like that of *E. Stuartiana*. Pale-coloured, a timber of promise, but data not available in regard to its economic merits.

Juvenile leaves.—Nearly orbicular or oblong, cordate at the base and stem-clasping, strictly opposite, gradually becoming broadly lanceolate and finally lanceolate: texture thickish, glabrous, slightly paler underneath. The midrib prominent, the main lateral veins also conspicuous and making approximately an angle of 45 degrees with the midrib. The ends of these lateral veins connected by loops (brachydodromous), said loops at a considerable distance from the edge. Besides these, there are a large number of fine anastomosing veins. Twigs nearly terete, reddish.

Mature leaves.—Rather large, 9 inches long by 1½ broad not being an uncommon size. Equally green on both sides, falcate, venation rather prominent, intramarginal vein at some distance from the edge, venation spreading.

Buds.—Sessile, the head of four to seven either on a short strap-shaped peduncle or this may be absent. The buds more or less angular by mutual compression. The operculum blunt conical or hemispherical.

Flowers.—Anthers opening in parallel slits.

Fruits.—Small, under ¼ inch in diameter, conoid or nearly hemispherical, rim narrow and slightly domed, valves (only three in the specimens seen) well exserted.

I dedicate this interesting species in honour of Sir Joseph Banks, companion of Captain Cook in his discovery of New South Wales.

RANGE.

This species occurs in both New South Wales and Queensland, and, so far as is known at present, is confined to New England, and to no great distance from the New South Wales-Queensland border.

Wallangarra, on the sides of hills at an elevation of about 3,500 feet (J. L. Boorman); Tenterfield (H. Deane); Wilson's Downfall (R. H. Cambage); Emmaville (J. L. Boorman).

AFFINITIES.

1. With *E. Stuartiana* F.v.M.

Wherever *E. Banksii* occurs in the same district as *E. Stuartiana*, the former occurs on the hills and slopes, and the latter (as is usual) on flats. It differs also from *E. Stuartiana* in bark (already described) and timber, also in the foliage. The new species has rarely glaucous juvenile foliage; it is coarser and more pedunculate. The mature foliage is larger and more pendulous than that of *E. Stuartiana*. As a rule the buds of *E. Stuartiana* are not angular, while the shape of the fruit is different. Its closest affinity appears, however, to be *E. Stuartiana*, and it appears to come between that species and *E. elæophora*.

2. With *E. elæophora* F.v.M.

The difference between this species (with which *E. goniocalyx* was formerly united) is in the absence of ribbons in the bark of the new species; it is also white in the inner bark, not yellow like *E. elæophora*. The bark of the latter is also much rougher than that of the new species. It is also a larger tree than *E. elæophora*. As regards the fruits, they are always smaller and less cylindrical than those of *E. elæophora*. Compare plates 82 and 103.

3. With *E. quadrangulata* Deane and Maiden.

The juvenile foliage sharply separates it from this species. The fruits and bark also are very different, but there is a general resemblance between the two species.

DESCRIPTION.

CXXXII. E. quadrangulata Deane and Maiden.

In *Proc. Linn. Soc. N.S.W.*, xxiv, 451 (1899).

A TREE of 80–100 feet and diameter of 2–4 feet.

Bark.—Very much resembles that of ordinary Box (*E. hemiphloia*) in general appearance, but bark more fuzzy and less soft than the latter; the timber also lighter in colour. The branches have smooth tips.

Timber.—Pale, not brown when fresh like *E. hemiphloia*, inlocked, very tough, evidently an excellent timber. The rougher bark falls off in patches, leaving box-like but less rough patches underneath. Again, these less-rough patches become darker and more rough, and this process is repeated *ad infinitum*.

Juvenile leaves.—Narrow-lanceolate, cordate and clasping at the base, strictly opposite, markedly paler on the under surface.

The rhachises are brown (commonly chocolate-brown) and usually square in section. Not only is the young stem quadrangulate, but it is even winged, and this is so marked a character that the name *alata* would probably have been chosen had this name not been preoccupied.

Other instances of quadrangular young stems in Eucalyptus are :—

E. tereticornis (apparently less common), *E. globulus*, and *E. Maideni*.

Mature leaves.—Branchlets angular, lanceolate or narrow-lanceolate, slightly falcate, usually 4 to 6 inches long, scarcely paler on the under surface.

The margin usually sinuate, jagged or remotely denticulate. Venation conspicuous on both sides, the intramarginal vein conspicuously removed from the edge, the lateral veins spreading. The texture of leaf thickish, hence the oil-dots, which are fairly numerous, are not prominent.

Buds.—Umbels axillary, consisting usually of four to eight in the head, not dull; sessile, the common stalk being broadish and strongly compressed. The calyces subconical and exceeding the operculum, which is conoid, the calyces sometimes angular.

Stamens all fertile, inflexed in bud, opening with longitudinal almost parallel slits, with a small gland at the back. The filament is attached about the middle, and the anther is versatile.

Fruits.—Small, shining, bell-shaped, rim medium, the valves slightly exserted, and usually three in number. The seeds small, without membranous expansion.

RANGE.

It is confined to New South Wales, to the coastal districts and lower coastal ranges, preferring, as so many trees do, the shelter and good soil of the gullies with an easterly aspect. So far as our records go at present, it extends from Bundanoon in the south to the Upper Hunter in the north, and westerly as far as Burragorang.

"White Box," exceedingly tall trees, growing in the gorge around this district to the depth of from 800–1,000 feet from the level of the surrounding country;

80–100 feet high, stems 3–4 feet in diameter, bark grey, suberous, slightly ribbony at tips of branches, the sap-wood yellow, centre red, darkening with age, interlocked in grain; fruits tubular, valves decidedly valvate, arranged (mostly) in threes, suckers glaucous, stems round, slightly angled. Used largely for sleepers. Bundanoon (J. L. Boorman). "White Box," very straight and some large; rough bark and clean limbs. Bundanoon (A. Murphy); 4 miles west of Bowral (R. H. Cambage and J.H.M.). "Black Box," near bridge at Colo Railway Station (J.H.M.); Colo (E. Cheel); Hill Top, Box Knob. The type (J.H.M.); The Oaks, Picton to Burragorang (R. H. Cambage); The Peaks, Burragorang—most westerly locality recorded (R. H. Cambage). "Soft White Box," Tillowrie, Milton (R. H. Cambage); Robertson, top of Macquarie Pass (J.H.M.); Dapto and Mount Kembla (R. H. Cambage); Bulli Pass (R. H. Cambage and J.H.M.).

Putty, south of Singleton (A. C. Barwick, per R. T. Baker).

"It grows in considerable quantity near here. I have measured a tree, and find that at 4 feet from ground the girth is 11 feet; at 60 feet the girth is 8 feet 10 inches; the main limbs start at a height of 80 feet from the ground. There are much larger trees growing near, but I found it easier to obtain the measurements from the fallen one. I have not noticed this Eucalyptus growing in the district, except on the western slopes (in scrub) of Mount Woollooma, in Forest Reserve 10,222, Parish of Belltrees, County of Durham, Land District of Scone." (H. L. White.)

AFFINITIES.

1. With *E. goniocalyx* F.v.M.

The juvenile foliage of *E. goniocalyx* presents considerable similarity to that of *E. quadrangulata*, differing chiefly in the greater breadth and shorter length of the former. The similarity of the mature foliage of the two species is unmistakable, and extends even to the margins; very large leaves have not, however, yet been found in *E. quadrangulata*. The shape of the fruits is, however, quite different, while *E. quadrangulata* is a Box and *E. goniocalyx* a Ribbony Gum.

2. With *E. nitens* Maiden.

The relations of these two species appear to be close. The rough bark of *E. quadrangulata* extends further up the stem, and it appears to be a larger tree. The buds of *E. quadrangulata* are more globular, and the fruits are broader at the orifice (frequently more so than depicted at fig. 6, Plate 103), while the valves are more exserted.

In *E. nitens* (see Plate 81) the buds are more angular, narrower and more elongated, the operculum being only half as long as the calyx-tube. The fruits are ovoid, have a small orifice, and the valves are rarely exserted. In *E. quadrangulata*

I have never seen such large intermediate leaves as are common in *E. nitens*, which attain 16 inches in length and have a wavy edge. The juvenile foliage is also larger in *E. nitens*.

3. With *E. Baueriana* Schauer var. *conica* Maiden.

In the bush this variety and *E. quadrangulata* certainly display some resemblance, but the conoid fruit and the juvenile foliage of the former (see Plate 60) readily separate them. *E. quadrangulata* is found in the coastal districts, while the former is not, although both occur on the tableland.

4. With *E. Stuartiana* F.v.M.

The small fruited forms of this species often resemble *E. quadrangulata*, so far as herbarium specimens are concerned, but the trees in the forest cannot readily be confused, that of *E. Stuartiana* being a somewhat scrambling tree with a thickish white bark, while *E. quadrangulata* is more erect in habit, with a comparatively dense bark and smooth branches. The juvenile leaves are quite different.

5. With *E. Macarthuri* Deane and Maiden.

The juvenile foliage of *E. Macarthuri* is sufficiently distinct from that of *E. quadrangulata*, nor are the stems of the former angular. The mature foliage of the two species is not dissimilar. The fruits of *E. Macarthuri* are rather smaller and the valves less exserted. Both species have fibrous barks, but one belongs to what is known as the Box group of barks, and the other to the Woollybutt group ; the timbers also are very different.

6. With *E. saligna* Sm.

In the occasional angularity of its buds and in the general shape of the fruits, there is some approach to *E. saligna*, but the buds of the latter are more pointed, the fruits more cylindrical, and the rim more sunk, while the venation of the leaves and the texture of the bark are very different.

Explanation of Plates (100 bis–103).

PLATE 100 (*bis*).*

Eucalyptus Deanei Maiden.

1*a*. Juvenile leaf ; 1*b*, large fruits with rims. Picton Lakes, N.S.W. (R. H. Cambage.)
2*a*. Juvenile leaf ; 2*b*, mature leaf ; 2*c*, fruits. Jamieson Valley, Blue Mountains, N.S.W. (W. Forsyth.)
3. Juvenile leaf. East of Glen Innes, N.S.W. (E. C. Andrews.)
4*a*. Mature leaf ; 4*b*, buds ; 4*c*, front and back view of anther. The Valley, near Springwood, N.S.W. (J.H.M.) The type.
5. Buds. Bluff River, near Tenterfield, N.S.W. (Henry Deane.)
6*a*. Small buds ; 6*b*, large buds ; 6*c*, three-valved fruits, the tips scarcely exsert ; 6*d*, fruits, the tips of the valves well exsert. From Boonoo Boonoo, Tenterfield district, N.S.W. (J. L. Boorman.)

Form reputed to be intermediate between *E. Deanei* Maiden and *E. saligna* Sm.

7*a*. Juvenile leaf (perhaps not characteristic) ; 7*b*, mature leaf ; 7*c*, buds ; 7*d*, front and back view of anthers ; 7*e*, fruits, also plan of one ; 7*f*, fruits with valves very exsert and strap-shaped peduncle. Jilliby Jilliby, near Wyong, N.S.W. (J. L. Boorman.)

* To avoid confusion with Plate 100, Part xxiii of the present work, which has been devoted to *E. saligna*.

PLATE 101.

E. Dunnii Maiden.

1*a*. Juvenile leaf; 1*b*, mature leaf; 1*c*, mature leaf, with the intramarginal vein further removed from the edge; 1*d*, buds; 1*e*, buds and flowers; 1*f*, front and back views of anther; 1*g*, fruits. Acacia Creek, Macpherson Range, N.S.W. (William Dunn.) The type.

E. Stuartiana F.v.M.

2*a*. Juvenile leaves; 2*b*, intermediate leaf; 2*c*, mature leaf; 2*d*, 2*e*, buds; 2*f*, front and back views of anther; 2*g*, fruits. "Back" road between Bright and Germanton, Victoria. (J.H.M.)

3. Large fruits. Armidale, N.S.W. (A. W. Howitt.)

E. Stuartiana var. *grossa*, var. nov.

4. Small pair of juvenile leaves. Hanging Rock, Nundle, N.S.W. (J.H.M. and J. L Boorman.) (See Plate 102.)

PLATE 102.

E. Stuartiana F.v.M. var. *grossa* var. nov. (See Plate 101.)

1*a*. Very coarse juvenile leaves; 1*b*, mature leaf; 1*c*, mature leaf with buds; 1*d*, buds; 1*e*, back and front views of anthers; 1*f*, fruits. Hanging Rock, Nundle, N.S.W. (J.H.M. and J. L. Boorman.)

2*a*. Leaf and fruits; 2*b*, buds. These very small fruits and these buds with more conical operculum seem to be anomalous. Very few were found, the vast majority being as figured No. 1.

E. Stuartiana F.v.M. var. *parviflora* Deane and Maiden.

3*a*. Juvenile leaf; 3*b*, intermediate leaf; 3*c*, mature leaf; 3*d*, buds; 3*e*, fruits. Hassan's Walls, near Bowenfels, N.S.W. (J.H.M.)

4. Fruits. King's Plains, Blayney, N.S.W. (J.H.M.)

PLATE 103.

E. Banksii Maiden.

1*a*. Juvenile leaves, nearly orbicular in shape; 1*b*, juvenile leaves; 1*c*, mature leaf; 1*d*, buds with somewhat pointed opercula; 1*e*, buds, angled; 1*f*, front and back views of anthers; 1*g*, 1*h*, fruits. Wallangarra, N.S.W.–Queensland border. (J. L. Boorman.) The type.

2. Buds and flowers. Tenterfield, New England, N.S.W. (C. Stuart.)

3. Fruits. Wilson's Downfall, N.S.W. (R. H. Cambage.)

E. quadrangulata Maiden.

4*a*. Juvenile leaves; 4*b*, mature leaf; 4*c*, buds; 4*d*, front and back views of anthers; 4*e*, section of young stem, showing its winged (quadrangulate) appearance. Hill Top, N.S.W. (J.H.M.) The type.

5. Juvenile leaves. Robertson, top of Macquarie Pass, N.S.W. (J.H.M.)

6. Fruits. Bundanoon, N.S.W. (J. L. Boorman.)

The following species of Eucalyptus are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets:—

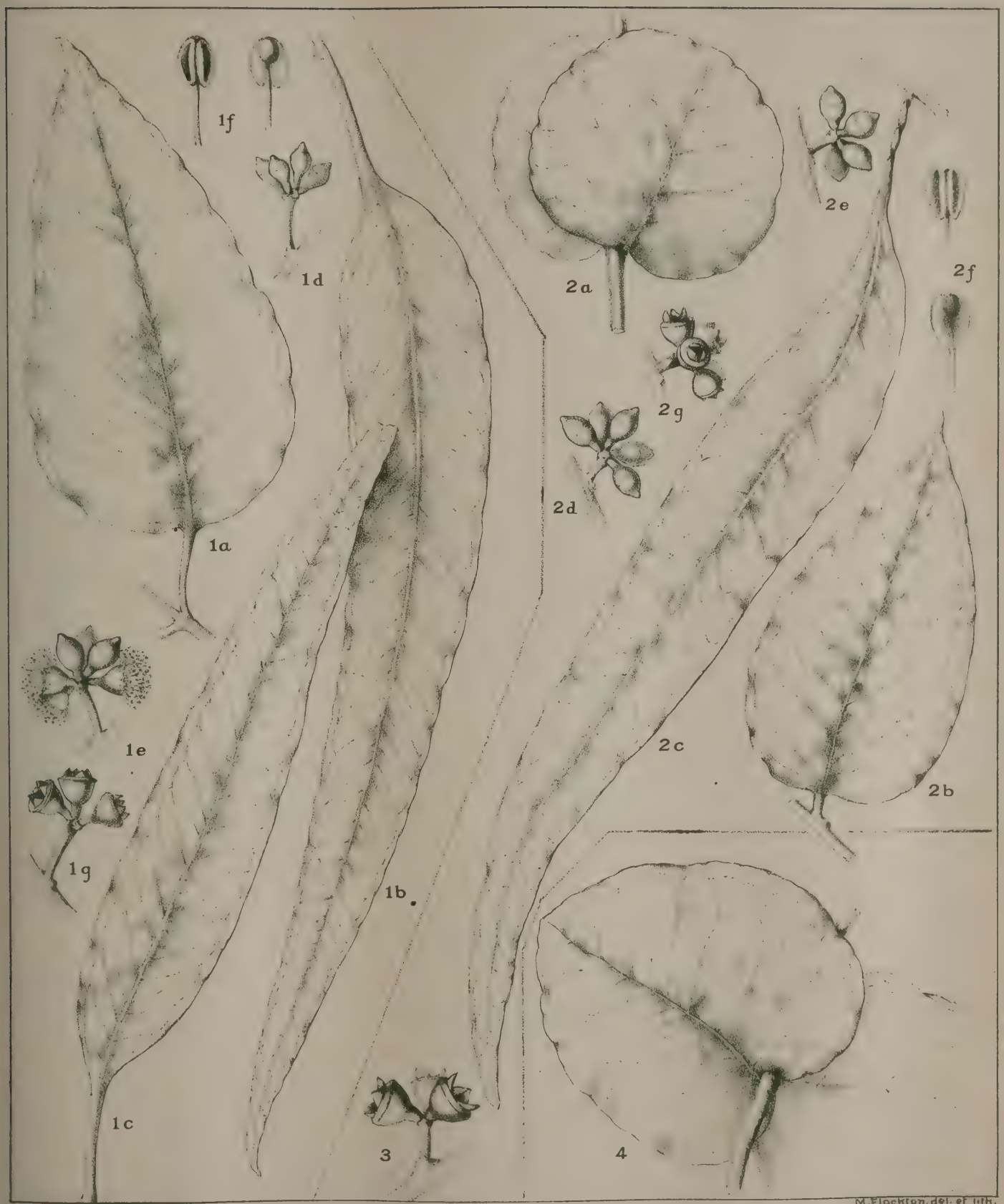
acacioides, A. Cunn. (xlviii).
acmenioides, Schauer (xxxii).
affinis, Deane and Maiden (lvi)
amygdalina, Labill. (xvi).
Andrewsi, Maiden (xxi).
Baileyana, F.v.M. (xxxv).
Behriana, F.v.M. (xlvi).
bicolor, A. Cunn. (xliv).
Boormani, Deane and Maiden (xlv).
Bosistoana, F.v.M. (xliii).
Caleyi, Maiden (lv).
capitellata, Sm. (xxviii).
Consideniana, Maiden (xxxvi).
coriacea, A. Cunn. (xv).
corymbosa, Sm. (xii).
dives, Schauer (xix).
fruticetorum, F.v.M. (xlii).
gigantea, Hook. f. (li).
goniocalyx, F.v.M. (v).
hæmastoma, Sm. (xxxvii).
hemiphloia, F.v.M. (vi).
longifolia, Link and Otto (ii).
Luehmanniana, F.v.M. (xxvi).
macrorrhyncha, F.v.M. (xxvii).
maculata, Hook. (vii).
melanophloia, F.v.M. (liv).
melliodora, A. Cunn. (ix).
microcorys, F.v.M. (xxxviii).
microtheca, F.v.M. (lii).
numerosa, Maiden (xvii).
obliqua, L'Hérit. (xxii).
ochrophloia, F.v.M. (l).
odorata, Behr and Schlechtendal (xlj).
paniculata, Sm. (viii).
pilularis, Sm. (xxxi).
piperita, Sm. (xxxiii).
Planchoniana, F.v.M. (xxiv).
populifolia, Hook. (xlvii).
punctata, DC. (x).
regnans, F.v.M. (xviii).
resinifera, Sm. (iii).
saligna, Sm. (iv).
siderophloia, Benth. (xxxix).
sideroxylon, A. Cunn. (xiii).
Sieberiana, F.v.M. (xxxiv).
stellulata, Sieb. (xiv).
tereticornis, Sm. (xi).
virgata, Sieb. (xxv).
vitrea, R. T. Baker (xxiii).

* Government Printer, Sydney. 4to. Price 1s. per part (10s. per 12 parts); each part containing 4 plates and other illustrations.

Sydney: William Applegate Gullick, Government Printer.—1915.

EUCALYPTUS DEANEI MAIDEN (*1–6*).

No. 7, a form reputed intermediate between it and *E. saligna*, SM.



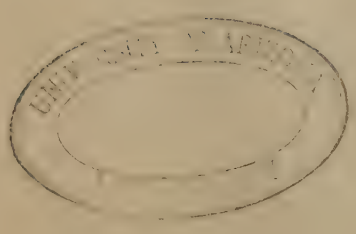
EUCALYPTUS DUNNII MAIDEN (*1*).

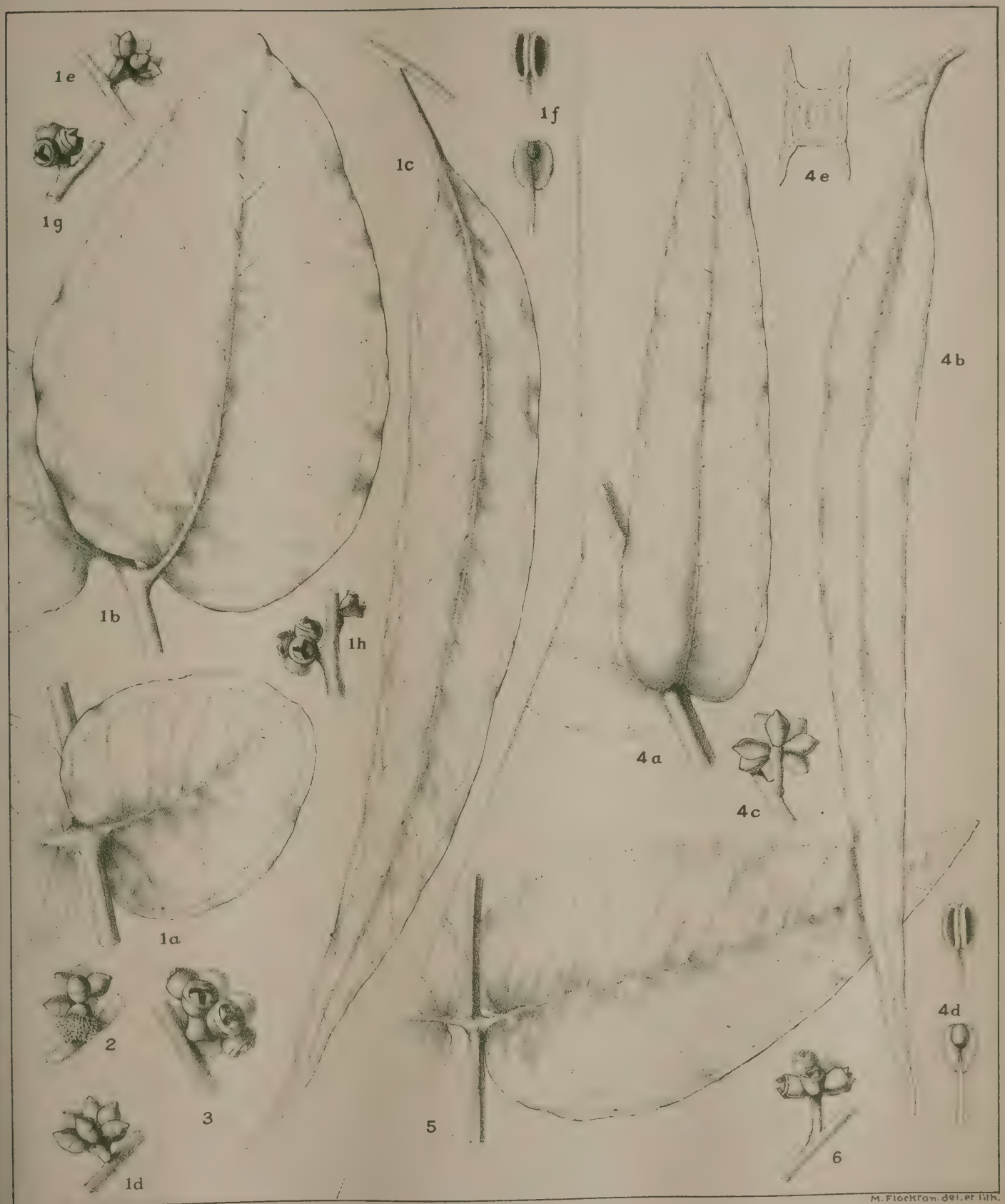
E. STUARTIANA F.v.M. (*2–3*). Normal form.

E. STUARTIANA *var. grossa, var. nov.* (*4*). [See Plate 102.]

EUCALYPTUS STUARTIANA F.v.M., *var. grossa, var. nov.* (*1–2.*) [See Plate 101.]

Var. parviflora DEANE AND MAIDEN (*3–4*).





EUCALYPTUS BANKSII MAIDEN (*1–3*).

E. QUADRANGULATA DEANE AND MAIDEN (*4–6*).

A Critical Revision of the genus Eucalyptus

BY

J. H. MAIDEN

(Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney).

Vol. III. Part 5.

Part XXV of the Complete Work.

(WITH FOUR PLATES.)

"Ages are spent in collecting materials, ages more in separating and combining them. Even when a system has been formed, there is still something to add, to alter, or to reject. Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages. In these pursuits, therefore, the first speculators lie under great disadvantages, and, even when they fail, are entitled to praise."

MACAULAY'S "ESSAY ON MILTON."

PRICE TWO SHILLINGS AND SIXPENCE.

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CXXXIII. Eucalyptus Macarthuri Deane and Maiden.

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Range 83
Affinities 84

CXXXIV. Eucalyptus aggregata Deane and Maiden.

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CXXXV. Eucalyptus parvifolia Cambage.

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CXXXVI. Eucalyptus alba Reinwardt.

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DESCRIPTION.

CXXXIII. E. Macarthuri Deane and Maiden.

THE CAMDEN WOOLLY-BUTT.

Proc. Linn. Soc. N.S.W. xxiv, 448 (1899), with plate xxxviii.

FOLLOWING is the original description :—

The history of this interesting species is as follows :—Sir William Macarthur collected its timber for the Paris Exhibition of 1855, it bearing the number 142 of the indigenous woods of the southern district he was commissioned to procure for this Exhibition. Under the name of " Woolly Gum of Argyle," he described it as follows : " A species of picturesque growth, confined to a limited extent of country; wood not esteemed,* reputed to possess little comparative strength or durability. Height, 40–80 feet; diameter, 36–48 inches."

The identical specimen was sent by Sir William to the London Exhibition of 1862, this time under the name of " Woolly Gum of Berrima," and it was described as " a tree of beautiful form, but the timber weak and worthless."

In the year 1864 Miss Atkinson (afterwards Mrs. Calvert) collected it, and the following is a copy of her label :—" Bark fibrous, Woolly Gum, Berrima. Large round tree, very hard wood, but not used, as it does not split well."

Her original specimens are in the National Herbarium of Victoria, and were seen by Bentham, who referred them to *E. viminalis*. See also *B.Fl.* iii, 240, where this species is referred to as " Camden Woolly Butt, Woolls."

Probably both Miss Atkinson and Dr. Woolls collected specimens, and the following passage was written soon after the arrival of the 3rd volume of the *Flora Australiensis* in the Colony :—

" *E. diversifolia*.—I have ventured to separate the ' Camden Woolly-butt ' from the ' Manna Gum ' (*E. viminalis*), with which it has been associated, because the trees differ so much from each other in bark, habit, &c. The Camden Woolly-butt resembles in some respects the Woolly-butt of other districts, having the lower part of the tree covered with fibrous bark and the upper branches smooth. The inflorescence, however, and the leaves are very different, being sometimes narrow-lanceolate and alternate, and sometimes cordate or ovate-acuminate, sessile and opposite. The buds and seed-vessels are small, generally eight in each axillary or lateral umbel. This species is common in the neighbourhood of Berrima, and attains the height of 80 feet, but beautiful as the form of the tree is, the wood is said to be indifferent."—Woolls' *Contribution to the Flora of Australia*, p. 235 (1867).

And again :—" *E. diversifolia*, which, in the *Flora*, is regarded as one of the forms of *E. viminalis*, is certainly a distinct species, and called ' Camden Woolly Butt.' The lower part of the tree is fibrous, and the leaves differ from narrow lanceolate and alternate to cordate, sessile and opposite."—Woolls' *Lectures on the Vegetable Kingdom*, p. 120 (1879).

It will thus be seen that Woolls did not agree with Bentham in placing the " Camden Woolly-butt " under *E. viminalis*, and he himself placed it under *E. diversifolia*. Woolls did this probably because he thought that the reference in *B.Fl.* iii, 240, to *E. diversifolia* was intended for the " Camden Woolly-butt," but it is not Bonpland's species, Mueller (*Eucalyptographia*, under *E. viminalis*) having shown that the plate in Pl. de Malmaison, 35, t. 13, represents a young state of *E. santalifolia*.

* With increased experience this estimate has been modified. I will present information on this point in my " Forest Flora of New South Wales."

In 1885 Dr. Woolls (*Plants of New South Wales*, p. 55) departed from the opinion he had so long held as to the claim of the " Camden Woolly-butt " to be a distinct species, and looked upon it as a form of *E. Stuartiana*, a statement which could only have been made without due consideration.

" *E. Stuartiana* has a wide range in New South Wales, being found on the Mittagong Range, the hills near Mudgee, and parts of New England. The bark is fibrous and persistent, and it is known by the popular names " Camden Woolly-butt," " Peppermint," or " Stringybark." On young trees the leaves are frequently opposite. It occurs on the Mittagong Range in company with *E. amygdalina*, and rises to the height of 100 feet."—(*Op. cit.*)

A specimen of " Mudgee Peppermint," so labelled by Dr. Woolls, is *E. Stuartiana*, and is not identical with " Camden Woolly-butt " as surmised by him on the label. This confusion of the two trees probably arose from the mixing of herbarium specimens. Peppermint is a bad name to apply to this tree, and doubtless arose simply from contemplation of its fibrous bark, which somewhat resembles that of some species known as " Peppermint." The leaves of the " Camden Woolly-butt " emit no odour of peppermint.

We name this species in honour of the late Sir William Macarthur, of Camden Park, who appears to have been the first to recognise this particular Woolly-butt as a distinct tree, while he was certainly one of the pioneers in the difficult task of diffusing accurate information in regard to the Eucalypts of New South Wales.

Vernacular Name.—" Camden Woolly-butt," after the County of Camden, New South Wales; it has, however, been found in the County of Argyle also; in fact it was originally called " Woolly Gum of Argyle." The name " Woolly-butt " or " Woolly Gum " is in reference to the texture of the bark and sapwood. It is not to be confused with the common Woolly-butt of the Sydney district (*E. longifolia*), the Woolly-butt of the South Coast (*E. saligna*), or that of the North Coast (*Tristania conferta*).

Bark.—Rough, somewhat Box-like, but very woolly. The sapwood also of a woolly texture.

Timber.—Pale coloured, nearly white. Not a favourite locally as it does not split well and is not durable. Additional notes on the reputed value of this timber have already been given.

Seedling Leaves.—Linear-lanceolate, slightly cordate, barely stem-clasping, strictly opposite.

Juvenile Leaves.—Cordate or ovate-acuminate, stem-clasping, sessile and opposite. Bright green in colour; of similar tint on both sides.

Mature Leaves.—Alternate, narrow, lanceolate, often falcate, thickish, of equal colour on both sides. Venation not prominent; intramarginal vein at some distance from edge; veins not springing from the base, pinnate.

Buds.—Small, the operculum and calyx of approximately equal size, the former but very slightly conical; shining; up to eight in the head but perhaps five on the average. Umbels axillary, with short scarcely flattened stalks, and stalklets absent or nearly so.

Anthers.—Small, ovoid in shape, opening in longitudinal slits; inflexed in bud; apparently all fertile. Stigma slightly dilated, having the appearance of being flattened on top.

Fruits.—Very small, much smaller than that of *E. Stuartiana*. Nearly hemispherical, slightly dilated at the rim, which is well defined; valves usually three but rarely four, scarcely exserted. Seeds small, without any appendage.

The habit of the tree is shown in plate xxxiv, *Proc. Linn. Soc. N.S.W.*, xxxi, (1906), from a photo at Bowral by Mr. R. H. Cambage.

Mr. H. G. Smith has examined the leaves and has written a paper* " On an Eucalyptus oil containing 60 per cent. of Geranyl Acetate." This constituent would render it important as a perfume, if it could be obtained at a sufficiently low price. I will refer to the matter in my " Forest Flora of New South Wales."

*Proc. Roy. Soc. N.S.W., xxxiv, 142 (1900).

SYNONYM.

E. diversifolia Woolls, non Bonpland.

See above, p. 81, and also Part VII, page 197 of the present work.

RANGE.

So far as we know at present, it is confined to New South Wales, but we do not know its limits yet. In the south it extends to the Goulburn district, and is found as far west as the Jenolan Caves. It is not recorded as far north as the Sydney district. I have received specimens labelled "timber exceedingly faulty, in poor stony country and locally rare, Wyndham, *viâ* Eden (J. L. Boorman), but as the specimens are not perfectly satisfactory, I say no more concerning them.

It prefers swampy or low-lying land, or to follow the course of a stream.

Specific localities are :—

Laggan and Crookwell Creeks (J. J. Hook, quoted by R. T. Baker in *Proc. Linn. Soc. N.S.W.* xxxi, 715, 1906), which seems the proved southerly record so far. It is a few miles north of Goulburn. Towrang (J. L. Boorman).

Paddy's River, near Wingello. "Ample deep green foliage, bark corky, not ribbony, even to the edges of the branches" (J. L. Boorman); Fitzroy Falls, near Moss Vale (W. Forsyth); Sutton Forest (J.H.M.); Berrima (J.H.M.); Burradoo, "Bark furrowed and stringy. Habit of Weeping Willow. Spreading tree of 60–70 feet and 2–3 feet diameter" (A. Murphy); Bowral to Bullio (R. H. Cambage and J.H.M.); Mittagong. "Locally known as Messmate and Mountain Ash" (W. Greenwood).

Jenolan Caves (W. F. Blakely); this is the most westerly locality known to me.

In *Papers and Proc. Roy. Soc. Tas.*, 1902, p. 83, I recorded *E. Macarthuri* for Tasmania, but formally corrected the mistake in the same publication for 1914, p. 30.

It is a species frequenting medium cold localities, and its usual range in the south-eastern quarter of New South Wales is from 2,000–3,500 feet.

AFFINITIES.

1. With *E. viminalis* Labill.

Bentham placed this tree under *E. viminalis*, but this was at a time when, as a general rule, herbarium specimens only were available. I have for many years insisted that the amplest data should be furnished. Unfortunately, as regards some species, they are not available even yet, and we sometimes take risks in naming.

E. viminalis is a "White Gum," *E. Macarthuri* a "Woolly Butt"; the timbers are different. The dried leaves of the former have a pleasant faint, apple-like smell not observable in the latter. The juvenile leaves of the two species are a good deal alike; the mature leaves of *E. viminalis* are longer and larger. The buds of *E. Macarthuri* are smaller, polished, pale brown; the fruits of *E. Macarthuri* are smaller, often in more than threes, and much smaller than those of *E. viminalis*, which have a well-defined rim, and well exserted valves.

2. With *E. Stuartiana* F.v.M.

Nor is its affinity close with this species, but I mention it because Woolls confused the two.

Reference to Plate 101 (Part XXIV) will show that the juvenile leaves of *E. Stuartiana* are nearly circular; the fruits and leaves of *E. Stuartiana* are much larger; the habit of *E. Stuartiana* is more scrambling; the bark and timber are different.

3. With *E. Benthami* Maiden and Cambage, *Proc. Roy. Soc. N.S.W.* xlviii, 418 (1914).

E. Benthami is a tall, rather erect tree with a somewhat thin canopy; *E. Macarthuri* is a taller tree with a somewhat umbrageous head. The bark of *E. Macarthuri* is rough somewhat Box-like, but very woolly; that of *E. Benthami* is smooth in the upper portion (it is a White Gum) and flaky at the base. Sometimes it is wholly smooth. The juvenile leaves of *E. Macarthuri* are much narrower than those of *E. Benthami*, which are broad.

4. With *E. aggregata* Deane and Maiden.

The relations of these two species will be referred to when *E. aggregata* reached (page 187).

DESCRIPTION.

CXXXIV. E. aggregata Deane and Maiden.

Proc. Linn. Soc. N.S.W. xxiv, 614 (1899).

Following is the original description :—

An umbrageous tree, probably worthy of cultivation in cold, damp situations for ornamental purposes.

Local Names.—" Peppermint " at Wallerawang, probably because of the fibrous appearance of the bark. Known as " Flooded Gum " in most districts, an exception to the usual rule in Australia to limit the term " Gum " to those species of Eucalypts having smooth or nearly smooth barks. It has been called both " Sally " and " Messmate " in the Crookwell district; while it is known as " Black Gum " at Fagan's Creek, according to Mr. Bäuerlen.

Size.—Usually small gnarled trees, but a number 30 or 40 feet with a trunk of 12–18 inches or even 2 feet.

Bark.—Box-like or rather more flaky; between that of a Box and a Stringybark or Woollybutt; cuts woolly. The trunk, large and small branches are all rough; the ultimate branchlets alone being smooth. In old trees very thick and containing essential oil.

Timber.—White and tough when fresh, but the trunk is usually not straight enough and large enough, as a general rule, for marketable timber; reckoned worthless for standing in the ground.

Young Leaves.—Quite glabrous; oval to nearly oblong; strictly opposite up to an inch long; the margins undulate; mucronate with a short point. Young trees are often eaten down by cattle.

Mature Leaves.—Foliage semi-pendulous, lanceolate in shape; usually symmetrical, but oblique leaves not rare; undulate; equally green on both sides, scarcely shining; on the average probably 4½ inches long by 1 broad. Intramarginal vein considerably removed from the edge; other veins few but conspicuous; very oblique.

Buds.—Usually four to six in the umbel, but sevens not rare; stalk up to ⅛ inch long, hardly compressed, more compressed as the fruit reaches maturity; the stalklets short and round. The operculum and calyx-tube about equal, and both tapering towards a point, the operculum being nearly conical.

Flowers.—Stamens apparently all fertile and inflected in the bud; stigma not dilated; anthers opening by parallel slits.

Fruits.—Hemispherical in shape and sometimes, owing to the shortening of the stalklets, so clustered together as to form a dense head, hence the specific name; small, not exceeding $\frac{3}{16}$ inch in diameter, with a well-defined, sharp rim, domed, and with 3 or 4 well exserted valves.

SYNONYM.

E. Rodwayi Baker and Smith, *Papers and Proc. Roy. Soc. Tas.*, 139 (1913).

The confusion arose in this way. In the same Journal, p. 83 (1902), I announced the discovery of *E. Macarthuri* Deane and Maiden between Deloraine and Chudleigh Junction, Tasmania. Some time since I found that, through working with imperfect material, the species was really *E. aggregata*, but I had not announced the correction, as I expected that that species would have come on earlier in the *Critical Revision*. Messrs. Baker and Smith, in their paper, correctly pronounced the tree to be not *Macarthuri*, but re-described it under the name *Rodwayi*. I have stated the position in *Papers and Proc. Roy. Soc. Tas.*, p. 30 (1914), and *Proc. Roy. Soc. N.S.W.* xlvii, 230 (1913).

RANGE.

It occurs in New South Wales and Tasmania in alluvial flats, following water-courses or depressions. Always found in damp situations, hence the name "Flooded Gum." It is a cold-loving species, found in a vertical height in the south-eastern part of New South Wales of 2,000–4,000 feet.

It will doubtless be found in Victoria.

TASMANIA.

On plains near Cheshunt. 60–100 feet high, and from $2\frac{1}{2}$ to $3\frac{1}{2}$ feet in diameter at the butt. Bark brownish, rough. Branches divaricating at 8 to 12 feet from the ground (W. H. Archer).

This specimen was referred by Archer himself, who was a valued correspondent of Hooker, the author of the "Flora Tasmaniæ," to *E. radiata* Hook. f. (non Sieb.) var 5 (see p. 137 of Hooker's work). In my *Crit. Rev.* i, 158, I also took that view, but examination of the anthers shows that it does not belong to the Renantheræ to which *E. amygdalina, radiata,* and *nitida* belong.

Swanport (Dr. Story).

Deloraine (R. H. Cambage and J.H.M.).

Locally called "Blue Gum." From 50 to 120 feet high, 2–3 feet in diameter, one tree 4 feet. Bark flaky on base and trunk, not so fibrous as *E. amygdalina.* Branches dirty white with flaky bark. Opossums feed on the young leaves. Guildford Junction (R. H. Cambage).

(In the original description it is stated that young trees are often eaten down by cattle, and it is one of the few species of the genus which are readily eaten by herbivora.)

New South Wales.

Southern Localities.—Between 13 and 14 mile-posts, Cooma Road, Braidwood. The most southerly locality recorded (R. H. Cambage); Fagan's Creek, Braidwood. (W. Baeuerlen); "Sally," "Messmate," Crookwell, also Nimbo Station, head of Queanbeyan River (H. Deane); Bungendore Road past Burbong, Queanbeyan (R. H. Cambage); Parish of Durren Durra, County of St. Vincent (C. J. Clulee).

Bindook Swamp, Yerranderie (R. H. Cambage); Berrima (J. L. Boorman).

Western Localities.—Walker's River, Wallerawang (A. Murphy).

"Sally" or "Peppermint." Fair-sized trees. Tips of the branches remarkably brittle. Plentiful along the lowlands of the district. Wallerawang (H. Deane, J.H.M., J. L. Boorman).

Capertee (J. L. Boorman).

"Flooded Gum." The bark is rough and brittle, inclined to be curly; it breaks off in small pieces from 4 to 5 inches, and is of a reddish-brown and a grey colour. It grows along the sides of swamps. Jenolan Caves (W. F. Blakely).

On Swatchfield Road, 11 miles south-west of Oberon (R. H. Cambage); "Black Gum," Oberon (H. W. Garling).

Near Orange, on the Cadia Road, which remains its most western locality at present (R. H. Cambage); Rockley, "Flooded Gum of Burraga" (R. H. Cambage).

AFFINITIES.

1. With *E. Macarthuri* Deane and Maiden.

Both grow in similar situations, are often somewhat similar in appearance, and, although *E. Macarthuri* is the more erect and handsome, have not dissimilar-looking fruit. The venation of the mature leaves and the shape of the juvenile leaves, however, divide them sharply. A confusion which arose between the two species has already been referred to. *E. Macarthuri* is a "Woolly-butt," and a common name for *E. aggregata* is "Black Gum." These two names fairly well indicate their barks, that of the former being softer and sub-fibrous, that of the latter being, as a rule, hard and flaky and often dark in colour. Plate 104 may be referred to.

2. With *E. camphora* R. T. Baker.

Both these species are Gums. The juvenile leaves of *E. camphora* have more spreading venation, are longer, often obovate, and always with long petioles. The buds are a good deal alike, but the operculum of *E. camphora* is more acuminate. The fruits are often so similar as to require caution, but the buds of *E. camphora* are more conoid, with a very short pedicel or sessile and sometimes prominently exserted valves.

DESCRIPTION.

CXXXV. E. parvifolia Cambage.

In *Proc. Linn. Soc. N.S.W.* xxxiv, 336 (1909), with two plates.

FOLLOWING is the original description :—

Arbor parva, umbrosa, alta pedes viginti trigintave (raro quadraginta), trunci diametro unciarum duodecim ad duodeviginti. *Folia tenera* ovata nec longiora una uncia, opposita, decussata, superficie inferiore pallida, nec alia plerumque folia sunt arboribus minoribus quam decem ad duodecim pedes. *Folia matura* lineali-lanceolata ad ovato-lanceolata, longa uncias duas et dimidium, saepe opposita, plerumque adunca ad extremum. *Gemmae* sessiles, parvae, operculo conicali ad obtusum, breviore quam calycistubus pedunculis axillaribus, planatis saepe oppositis longis circiter unam lineam. *Flores* in umbella quinque sexve, raro septem. Antheris versatilibus mediocri magnitudine, cellis fere parallelis, paulo latioribus ad imum glande parva. *Fructus* globoso-truncatus, diametro raro plus quam duarum linearum, interdum contractior ad orificium, valvis non exsertis. *Cortex* levis, colore cinereo vel plumboso. *Materia* colore roseoi, mollis et fragilior.

A small umbrageous tree reaching 20–30 feet high, rarely 40 feet, with stem-diameter of 12–18 inches.

Juvenile Leaves.—Ovate, under 1 inch long, opposite, decussate, under side pale, usually the only foliage on trees up to 10–12 feet high.

Mature Leaves.—Linear-lanceolate to ovate-lanceolate, up to 2½ inches long, often opposite, the tips usually hooked.

Buds.—Sessile, small, the operculum conical to obtuse, shorter than the calyx-tube, peduncles axillary, flattened, often opposite, about 1 line long.

Flowers.—Five or six in umbel, rarely seven. Anthers versatile, of medium size, the cells nearly parallel, rather broader at the base, small gland.

Fruits.—Globular-truncate, rarely exceeding 2 lines in diameter, sometimes slightly contracted at the orifice, valves not exserted.

Bark.—Smooth, dull grey to lead colour.

Timber.—Pale pink, soft and rather brittle.

RANGE.

It is at present only known from the locality whence the type was obtained, viz., flat land near the head of the Kybean River, Nimitybelle, in the Monaro, N.S.W., a very bleak situation at an elevation of about 3,500 feet.

AFFINITIES.

1 and 2. With *E. acaciæformis* Deane and Maiden and *E. aggregata* Deane and Maiden.

It differs from both *E. acaciaformis* and *E. aggregata* in the bark, which is fibrous, while that of *E. parvifolia* is smooth. The leaves of the former two soon become alternate, while many of those of the latter remain opposite, even when the trees are full grown, or much longer than is usual with the great majority of Eucalypts. (R. H. Cambage, *loc. cit.*)

3. With *E. stellulata* Sieb.

In bark (partly), fruits and habit, but differs absolutely in foliage, both as regards venation and disposition. (R. H. Cambage.)

4. With *E. eugenioides* Sieb. var. *nana* Deane and Maiden.

In the shape of juvenile foliage and fruits, but differs in bark, timber, anthers, and mature foliage. (R. H. Cambage.)

E. parvifolia is an interesting species whose affinities require further investigation. Messrs. Baker and Smith (*loc. cit.*) state that its oil indicates affinity with *E. globulus* Labill.

DESCRIPTION.

CXXXVII. E. alba Reinwardt.

Following is the original description, for which I am indebted to the kindness of the Director of the Botanic Garden at Buitenzorg, Java :—

E. operculo conico acutiusculo calicem aequante, umbellis paucifloris lateralibus, foliis longiter petiolatis ovato-lanceolatis basi oblique attenuatis coriaceis margine subincrassatis (arbor trunco albido; aff. *E. marginatæ* et *E. multiflorœ*).

Crescit in insula Timor a Cl. Reinwardt detecta.

Floret toto anno (Herb. Rwdt. (Blume Rydz. [Fl. N.J.]) 1101 [1826]).

There is no plate with the description. Another form of quotation is *Bijdragen* (*Flora Ned. Indie*), 1101.

Then we have :—

Eucalyptus alba.—E. foliis ovato-lanceolatis attenuatis basi subinaequilateralibus rotundatis coriaceis utrinque glaucescentibus longiuscule petiolatis; operculo conoideo calycem cupuliformem aequante.

Eucalyptus alba Blum. *Bijdr.* p. 1101.

Rami teretes subfusci laeves, ramulis herbaceis glaucescentibus. *Folia* alterna rarissimè opposita, 2½–4 poll. longa, 1–2 lata, ovato-lanceolata attenuata (foliis *E. obliquæ* latiora), integerrima, basi rotundata, inaequilatera v. subacuminata, concoloria, glaucescentia, coriacea, penninervia, glanduloso-punctulata, punctis creberrimis vix conspicuis resinosis, fuscis, petiolata petiolo suprà plano semitereti, poll. 1½ longo. *Flores* cymosi, cymis paucifloris axillaribus, petiolo brevioribus pedunculis semipollicaribus angulatis. *Operculum* conicum acutiusculum calycem aequans (ex Blum. l.c.). *Calyx* cupulaeformis laevis glaber, basi subangulato-quadrinervosus, margine obtuso. Capsula quadri- vel rarius 3-locularis, valvis erectis calycem vix superantibus, acuminatis. *Semina* haud vidi. (Decaisne in *Nouv. Ann. Mus. Par.*, Vol. 3, 1834, p. 454.)

Walpers' description is :—

Operculo conico, acutiusculo calycem aequante; umbellis paucifloris lateralib.; foll. longiter petiolatis ovato-lanceolatis, basi oblique attenuatis coriaceis, margine subincrassatis.—Affinis *E. marginatæ* et *multiflorœ*.—In insula Timor. (Walp. *Repert.* ii, Suppl. i, 927 [1843.])

Another version is :—

206. *Eucalyptus alba*, Rwdt., ramulis angulatis; foliis sparsis (plerumque alternis) longe petiolatis ovatis v. ovato-lanceolatis acuminatis v. acutis obtusisve basi aequalibus v. parum inaequalibus coriaceis glabris obsolete penninerviis; umbellis 3–7-floris; operculo conico calycis tubum basi in stipitem triquetrum attenuatum adaequante. Bl. *Bijdr.* p. 1101. Decaisne in *Nouv. Ann. Mus. d'hist. Nat.* 111, p. 454. Spanoghe in *Linn.* xv, p. 203, n. 349. Walp. *Repert Bot.* ii, Suppl. 1, p. 927, 21.—*Kaju puti* Malaice.—In Timor. (Blume *Mus. Bot. Lugd. Bot.*, Vol. i, 1849, p. 83.)

The type of *E. alba* came from Timor, and figures 3 and 4 of Plate 105 received from that island, through the Director of the Botanic Gardens at Buitenzorg, Java, probably represent average specimens of the species. The long lanceolate leaf (Fig. No. 3, Plate 105) is not as frequently represented in our collections as the broader ones, but we have it in Plate 105, Fig. 1 (*E. Leucadendron*) and 3b of Plate 106 (Stannary Hills, North Queensland).

A form of *E. alba* has been described under the name of *E. platyphylla*, and following is how they are contrasted in *B.Fl.* iii, 197 :—

" Leaves broad, with very diverging veins and distinctly reticulate.

" Flowers nearly sessile or on short thick pedicels. Operculum hemispherical, short ... ... *E. platyphylla.*

" Flowers small, distinctly pedicellate, operculum conical ... ... *E. alba.*"

The flowers are usually in 7's, so far as seen, though sometimes the scars are difficult to observe.

The character of the operculum is very variable, and conical and hemispherical opercula are sometimes found on the same tree. The length of the pedicel is also variable.

The fruits vary both as to the shape, and as to the amount of exsertion of the valves.

The size of the various parts varies exceedingly. Less than half a juvenile leaf is shown at fig. 6, Plate 106, and other instances of variation in the sizes of the leaves are shown in Plates 105 to 107.

Mr. Spencer Moore's *E. pastoralis* is shown at figs. 7–9, Plate 105. It seems to me a coarse form of Mueller's *E. platyphylla*, which he himself suppressed and put under *E. alba*. Figs 6a and 6b (Plate 105) are from a tree common at Port Darwin which Mueller labelled *E. platyphylla*, and fig. 7 from the same locality, and which falls under *E. pastoralis*, is not coarser than buds I have seen from Port Darwin trees always looked upon as *E. platyphylla*. *E. pastoralis* represents the largest flowered form of *E. platyphylla* (*alba*), and, in my view, it is too weak a species to stand.

In Plates 105–107 I have figured a number of variations of *E. alba*, and it seems to me that they form a continuous series.

Eucalyptus platyphylla F.v.M. is called " Nankeen Gum," from the peculiar light brown colour of its bark. It is the " White Gum " of Queensland, where it has a different appearance to that in Northern Australia. " Deciduous Gum." The timber is poor.

" One thing which strikes the observer is the enormous size of the leaves of a small scrubby Gum which grows close to the ground. It is no uncommon thing to see saplings with leaves a foot long, and half as broad. This is the young state of this species. It is the commonest Gum-tree of all tropical Australia and will grow on the poorest soil, but the leaves of the adult tree are not very large." (Tenison-Woods, *Explorations in Northern Australia.*)

Following is a note on *E. alba* taken by me while standing in front of the trees at North Rockhampton, Queensland :—

" Poplar Gum. A Cabbage Gum. Timber will not split. Excellent firewood. An entirely smooth bark without flakes, a typical White or Cabbage Gum. Though not a very tall tree, it has a good trunk, although often scrambling. Branches brittle, common from Gladstone northward."

Messrs. Schimmel & Co. described *E. alba* oil from Java as colourless, very volatile, and with a pleasant nutmeg-like odour.

Mr. W. V. Fitzgerald speaks of it (as *E. platyphylla*) in North-West Australia as "a copious oil producer." The abundance of oil in this species is implied by the name "Kaju-puti" (Cajeput), applied to it in Malaysia in common with other trees also rich in oil.

SYNONYMS (and reputed Synonyms).

1. *E. moluccana* Roxb.
2. *E. obliqua* Decaisne.
3. *E. populifolia* No. 1, of Hook.
4. *E. Decaisneana* Blume.
5. *E. Leucadendron* Reinwardt.
6. *E. tectifica* F.v.M.
7. *E. platyphylla* F.v.M.
8. *E. bigalerita* F.v.M.
9. *E. pastoralis* Spencer Moore.

1. *E. moluccana* Roxb.

Lid conical, shorter than the calyx. Panicles lateral, composed of peduncled heads, of six or seven flowers. Leaves alternate, petioled, lanceolate, entire, firm and polished. (Roxb. *Fl. Ind.* ii, 498, 1832.) Miquel in *Fl. Ind. Bat.* i, Part i, 398, refers it to *E. alba*, but Bentham throws doubt on it, which he has a right to do, if no specimens are available.

2. *E. obliqua* Decaisne.

E. foliis lanceolato-elongatis acuminatis coriaceis inaequilateralibus rotundatis petiolatis; cymis axillaribus, pedunculis petiolum aequantibus 5–9-floris; calyce turbinato integro.

Eucalyptus obliqua L'Hérit. *Sert. Ang.* 18. DC. *Prod.* 3, 219. Lamk. *Ill.* t. 422. *Nouv. Ann. Mus. Par.*, Vol. 3, 454 (1834).

Blume (see *E. Decaisneana* below) states that *E. obliqua* Dcne. is a synonym of his *E. Decaisneana*.

3. *E. populifolia*, No. 1, Hook.

Hooker described two species under this name, and I have called that No. 1, which was described in Mitchell's work, reserving the designation No. 2 for that described in the Icones t. 879 (1852).

Following is the description :—

Hook. MS. ; foliis rhombeo-triangularibis obtusissimis longius petiolatis coriaceis minute punctatis (punctis pallidis) reticulato-venosis.

" This species is remarkable in the size and shape of its petiolated leaves. The branches bear turbinated woody excrescences (galls), each with two or more, generally three, sharp angles, and as many unequal, projecting wings, altogether exactly resembling the fruit of some Begonia." (Mitchell's *Trop. Austral.* 204, 1848.)

Following refers to one of the above specimens :—

" No. 336. June, 1846. *Eucalyptus populifolius* Hook. *Ic.* t. 879, and galls. Sub-tropical New Holland. Lieut.-Col. Sir T. L. Mitchell." (Copy of a label in Herb. Cant. ex herb. Lindl.) Figured at figs. 2a and 2b, Plate 106.

Doubtless similar to the Mount Owen specimen referred to by Bentham below.

" *E. populifolia* Hook. from near Mount Owen, Mitchell, without flowers or fruits, but with remarkably shaped galls on the branches, belongs more probably to *E. platyphylla* than to *E. polyanthemos*." (*B.Fl.* iii, 243.)

For a reference to Mt. Owen, see Mitchell's " Tropical Australia," p. 204.

Mr. Froggatt informs me that these winged galls (fig. 2a) are the female galls of *Brachyscelis munita* Schrader, and that the dots on the leaves (fig. 2b) are made by parasitic hymenoptera (Chalcideæ).

I have referred to the confusion which has arisen through Hooker having named two distinct trees *E. populifolius* under *E. populifolia* Hook., (as now accepted), at Part X page 342 of this work. See also (under *E. populnea* F.v.M.) at page 340.

Still another *E. populifolia*, viz., *E. populifolia* Desf., I shall refer to under *E. tereticornis* Sm.

4. *E. Decaisneana* Blume.

" 205. *Eucalyptus Decaisneana* Bl., ramulis compresso-tetragonis; foliis alternis lanceolatis falcatis acuminatissimis basi valde inaequalibus coriaceis glabris penninerviis; pedunculis axillaribus compressis petiolum adaequantibus umbellato 5–9 floris; operculo hemisphaerico mucronulato calycis tubo turbinato triplo breviore.—*E. obliqua* (haud Herit. !) Decaisne in *Nouv. Ann. Mus. d'hist. Nat.* iii, p. 454 (excl. omnib. Syn.). In Timor." (Blume in *Mus. Bot. Lugd-Bat.*, Vol. 1, p. 83, 1849.)

" *E. Decaisneana*, according to Timor specimens kindly sent by Dr. Scheffer, the Director of the Botanic Gardens, Java, belongs to the series Normales, not to Renantherae; its leaves are more or less conspicuously inaequilateral, the margin of the calyx-tube is somewhat protruding beyond the vertex of the capsule at least in a young state." (Mueller, *Papuan Plants*, i, 9 [1875]).

" Indeed also *E. Decaisneana*, if rightly recognised, may prove only a variety of *E. alba*." (Mueller in *Eucalyptographia* under *E. alba*.) I have not seen authentic specimens of E. *Decaisneana*.

5. " 102. *E. Leucadendron*, Rwdt. mss. Trunco niveo, glaberrimo; foliis alternis, longo-petiolatis, subdeltoideo-ovatis vel lanceolato-ovatis, utraque basis parte parum attenuatis, inaequalibus, pallide-viridibus, venosis, integerrimis, glabris, apice acutis vel obtusis; umbellulis in ramis infra folia pedunculatis, racemosisque, 5–8 floris; calycibus turbinatis; operculo conico (tum vero plano-convexo) calycis cum basi stipitem triquetrum attenuatum fere aequante; ovario 4-loculari; seminibus immaturis paleaceis. (Partim juxta Reinwardtii schedulas.)

"Arbor excelsa, cortice caduco, spadiceo, trunco niveo, glaberrimo, e longinquo conspicienda, foliisque Populi sive Crotonis cujusdam facie. Copiose in campis elatis et sterilioribus montium calcareorum insulae Timor." Rwdt. in mss.

In diario itineris Reinwardtii in insulis Moluccanis haec lego circa locum natalem in insula Timore: "In montosis calcareis praeter Mimosas et aliam pulcherrimam vidi arborem, trunco niveo, propter corticem valde caducum. Est nimirum *Eucalyptus Leucadendron*, cujus omnes partes, ubi fricantur, odorem valde fragrantem spargunt." Vidit hanc arborem in interiore insulae d. 11 m. Aprilis, 1821. Schedula in herb. haec habet: "*Eucalyptus Leucadendron*. 1342. Insulae Timor montes calcarei." Cel. Blume hanc plantam commemoravit inspecto Reinwardtii Herbario, et quidem hac ratione: "*Eucalyptus alba*. Herb. Rwdt. crescit in ins. Timor a Cl. Reinwardt detecta"—Cfr. bijdr. 1101. Jam neque herbarii schedula, neque adnotationes manuscriptae, neque tandem scripta itineris relatio habent nomen: "*Eucalyptus alba*." sed ubivis lego "*Eucalyptus Leucadendron*." Nomen igitur inventoris non bene mihi videtur esse mutatum. Accedit quod nomen specificum *Leucadendron* eximie indicat proprietatem, sive characterem ex habitu petendum. Equidem igitur non sine jure mihi videor Reinwardtii restituere nomen, quippe ab inventore impositum, sperans fore ut botanici hodierni non sint dubitaturi hoc Reinwardtianum nomen, probabiliter aliquo errore mutatum, mecum admittere.

Cel. Decaisne in Description d'un Herb. de Timor (*Nouvelles Ann. du Mus. d'hist. nat.* III, 336) eandem plantam commemoravit, lectam in insula Timore a Riedlé et Guichenot,* duobus collectoribus anno 1801, qui tamen ei nomen non videntur imposuisse. Synonymia ergo haec erit.

E. Leucadendron, Rwdt. *E. alba*, Rwdt. *Bl. bijdr. fl. Ned. Ind.* p. 1101 (non Reinwdt. herb.). Decaisne in *Nouv. Ann. Mus.* III, p. 454. 1834. Spanoghe in *Prodr. Florae Timorensis*. 1836. Linn. XV, 1836, p. 203, n. 394. Bl. *mus. bot.* I. 83. Walp. *Rep.* II, suppl. I. p. 927. 21. Miq. *Fl. ind.* 398. *Eucalyptus Moluccana*, Roxb. *Fl. ind.* II, 498? Ex ins. Moluccis in Hortum Calcuttae translata est.

In mss. Auctoris haec legimus: "1342. Eucalyptus Leucadendron R. (alba Bl. n. A. 3, 454, i.e., *Nouvelles Annales*.) Operculo conico, acuto, calyci fere aequali, umbellis simplicibus, solitariis; foliis deltoideo-ovatis, attenuatis, obtusis.

Arbor praestantissima, cortice caduco, spadiceo, trunco niveo, glaberrimo, e longinquo conspicua est. Cuncta olent odore forti, aromatico Cajeputi aemulo, praesertim vero germina et fructus immaturi: capsulae enim resina turgent. Folia sunt lanceolato-ovata s. subdeltoidea, utrinque basi parum, sursum longius attenuata, 10–12 cent. longa, 5–6 cent. longa, pallida, viridia, venosa, integerrima, glabra, subtus (sub lente) punctata, oleifera. Umbellulae in ramulis infra folia pedunculatae racemosae, 5–8 florae. Calycis turbinati, subhemisphaerici, truncati, integerrimi operculum plano-convexum tegit stamina floris nondum aperti. Filamenta sunt longissima, capillaria, calycis ori inserta, pleraque libera, calyce longiora? Germen calyce profundiore cinctum. Stylus erectus, parum exsertus. Ovarium 4-loculare, seminibus immaturis paleaceis. Cfr. tamen Calyptranthes caryophyllifolia, Linn., ex icone Rumphii, sed baccam certe fieri non credo."

Ad verbum descripsimus, ut constet, quid de hac planta Auctor cognoverit. Paucissima quae addamus restant, nam ex ante dictis satis superque historia elucescit. Petioli sunt 3–3½ cent. longi: limbi 12½ cent. longi, 4 cent. lati: basis foliorum est subdecurrens juxta petiolum: folia sunt subopposita et sursum alterna, margine quamvis integerrima, tamen (ad lentem visa) sunt parum subrepandula. Pedunculus communis fere 1 cent. aequat, uti et pedicelli: alabastra sunt fere pyriformia, apice conica et calyptra lineola circulari acuta ab ipso calycis fundo distincta. Cfr. tab. V. (Reinwdt. in De Vriese *Pl. Ind. Bat. Or.* p. 63 [1856].)

Mueller first notes that *E. Leucadendron* is, according to Miquel, l.c., 1085, synonymous with *E. alba*.

Examination of De Vriese's *Plantæ Indiæ Bataviæ Orientalis*, t. v, leaves little doubt in my mind that *E. alba* is intended, although it is not an entirely satisfactory plate.

* These were gardeners on the "Géographe" (Bandin's Expedition of Discovery to Australia, 1800-4). See my brief notes on these men in Proc.: Aust. Assoc. Adv. of Science, xi. 176 (1907), and Proc: Roy. Soc. N.S.W., xliv. 132 (1910).

Specimens communicated to me from "Herb. Mus. Paris ex herb. Ad. Brongniart, 1864, and labelled *E. Leucadendron* Reinwardt and *E. alba* Reinwardt," appear to be the latter species.

6. *E. tectifica* F.v.M.

Arborea, ramulis tenuibus teretiusculis, foliis alternis tenui-coriaceis breviuscule petiolatis ovato vel angusto-lanceolatis antice longe acutatis tenui-venosis opacis imperforatis, vena longitudinali ad marginem valde approximata, umbellis axillaribus solitariis vel terminalibus subpaniculatis, pedicellis angulatis calycis tubum aequantibus pedunculo brevioribus, operculo conico acuminato tuboque semiovato aequilongis . . . . . Hab. In vallibus graminosis fluminis McArthur (Macarthur) originem versus. (N. Holl. Sub.-Trop., Mitchell in Hb. Hook.) Anth. Aug., Sept.

Arbor excelsior, cortice dilute cinereo rugoso in trunco ramisque persistente. Folia semipedalia vel paulo breviora, inferne $\frac{3}{4}$–$1\frac{1}{2}$ poll. lata, venis primarus patentibus, secundarius reticulato-anastomosantibus. Flores in specimine collecto nondum bene evoluti. Pedunculi tenues 2–3 ″ longi. Alabastra 2 ‴ longa, postea forsan acuta. Fructus desunt.

Nativis cortex adhibetur ad habitiunculas perrudes construendas. (*Journ. Linn. Soc.* iii, 92 [1859].

Leichhardt, *op. cit.*, p. 413, says :—

"I called this river the "Macarthur," in acknowledgment of the liberal support my expedition received from Messrs. James and William Macarthur, of Camden." The Macarthur River runs (it is presumed, for the whole of its course has not been explored) into the south-western part of the Gulf of Carpentaria.

In *Journ. Linn. Soc.* iii, 92, specimens from the Upper Macarthur River (presumably collected either by Leichhardt or Mueller) are referred to *E. tectifica*.

But as regards the second specimen quoted in the original description, viz., "N. Holl. Sub-trop. Mitchell in herb. Hook." Bentham (*B.Fl.* iii, 243, under *E. alba*) says that "Mitchell's specimens, referred by Black in *Journ. Linn. Soc.* iii, 92, to *E. tectifica*, belong to *E. dealbata*, the leaves of which sometimes assume the form of those of *E. alba*, but with a different venation." Therefore only the Macarthur River specimen (the type) can be referred to *E. tectifica*.

E. tectifica was so called because "the bark of the Carpentaria tree (was) persistent and rough, as well on the branches as on the stem, though it is certainly pale outside and is used by the aborigines there for constructing the rude roofs of their sleeping-places" . . . . (*Eucalyptographia* under *E. alba*).

"*E. alba* has the leaves nearly aequilateral, the almost hemispherical calyx-lid protracted into an umbonate apex, the capsules 3–4 celled, the valves barely semi-exserted, and the seeds wingless. The identity of *E. tectifica* with *E. alba* is not yet established beyond doubt." (Mueller, *Papuan Plants*, i, 9.)

Mueller evidently removed this doubt later, for in his "Second Census" he omits *E. tectifica*, and no other inference is possible other than that he considered it a synonym of *E. alba*.

7. *E. platyphylla* F.v.M.

"Arborea ramulis teretiusculis, foliis alternis vel suboppositis longe petiolatis ovato—vel cordato—orbicularibus nunc subrhombeis raro ovato-lanceolatis opacis prominenter penniveniis pellucide punctatis vena perpherica amargine remota, umbellis axillaribus vel lateralibus 3–7-floris pedunculis angulatis calyci aequilongi tubo hemiphaerico ecostato operculum semiglobosum muticum laeve longitudine aequante, fructibus turbinato-hemisphaericis 3–4-loculatis vertice leniter convexis, valvis margini affixis exsertis, seminibus apteris.

Hab. In pascuus fertilibus ad flumen Burdekin (Ora orient trop. A. Cunningham, hb. Hook.) Anth. Sep.-Nov.

Arbor mediocris vel major, cortice trunci ramorumque laevi mox albido, secedentibus stratis extimis tenuibus fuscentibus. Petioli semiteretes 1–1½ ″ longi. Folia tenui-coriacea utplurimum 2–3 ″ longa saepe in petiolum breviter, decurrentia. Calycis tubus 1½–2 ″ metiens. Operculum pallidius simplex (qua nota a simili E. bigalerita praesertim dignoscitur). Stamina ad 3 ‴ longa albida. Capsula 2 ‴ longa. *E. bigaleritae* proxima. (*Journ. Linn. Soc.* iii, 93, 1859.)

Mueller (*Eucalyptographia* under *E. alba*) says :—

E. platyphylla F.v.M., *Journ. Linn. Soc.* iii, 93, approaches closely to *E. alba*; the leaves are mostly broader, the lid is generally shorter and blunt and the valves less exserted; its foliage sheds for short periods almost entirely. The range and variability of these trees remains yet to be further ascertained by extended field researches.

In his Census he omits *E. platyphylla*, considering it to be conspecific with *E. alba*.

" *E. platyphylla.* I cannot distinguish (*E. alba*) from this, even as a variety." (J. G. Luehmann in *Proc. Aust. Assoc. Adv. Science*, vii, 532, 1898.) I concur in that opinion.

8. *E. bigalerita* F.v.M.

Arborea, ramulis teretiusculis, foliis alternis rarius oppositis longe petiolatis cordatis vel subtrapezoides acutiusculis nunc acuminatis vix pellucide punctatis opacis penniveniis, vena peripherica a margine inaequaliter remota, umbellis lateralibus axillaribusque 4–7-floris solitariis, pedunculo crasso verruculoso calycibus parum longiore cum pedicello perbrevi anguloso, calycis tubo semi-ovato 3–2-costulato operculo triplo longiore, operculo duplici : utroque obtusissimo coriaceo vel externo apiculato . . . .

Hab. In pratis fertilioribus sylvaticis tractus australis terrae Arnheim's Land (3–5 Jul., 1856).

Anth. Jul.-Sept.

Arbor parva vel mediocris rarius excelsa, gummi-resina pulchre rubiginosa abunde scatens. Cortex post strati supremi laevis cinerei lapsum dilute fulvidus laevigatus. Folia pleraque 3–4″ longa, 2–3″ lata, petiolo inferne teretiusculo superne semitereti 1½–2″ longo praedita, satis saturate viridia. Calyces circiter 3 ‴ longi virides. Operculum externum (denique fuscescens) cito secedens bi-tricostulatum, costis iisdem tubi continuis; operculum internum virens ecostatum. Fructum non habui. (*Journ. Linn. Soc.* iii, 96 [1859].)

E. bigalerita F. Muell. from the Upper Roper River appears to me to be *E. platyphylla*, with the outer operculum persisting till the bud has nearly attained its full size, whilst in the majority of specimens it falls off at a very early stage. (*B.Fl.* iii, 243.)

E. bigalerita was not enumerated by Mueller in his " Second Census," and it is assumed that Mueller included it under *E. alba*.

9. *E. pastoralis* Spencer Moore.

Eucalyptus (§ Parallelantherae) *pastoralis.* Verisimiliter arborea, levis, ramulis subteretibus cortice tenero subfusco laxiuscule obductis, foliis sparsis magnis sat longe petiolatis late rotundato-ovatis obtusissimis basi latissima paullulum obliquis coriaceis crebro glanduloso-punctatis costis secundariis pluribus patentibus costa intramarginali a margine parum remota, umbellis axillaribus vel lateralibus 2–5-floris, pedunculis abbreviatis subquadrangularibus, pedicellis fere evanidis crassiusculis, alabastris majusculis subsphaeroideis, operculo haemispherico obtusissimo calycis tubo breviore, staminibus omnibus fertilibus ante floritionem infractis, antheris oblongo-ovatis, stigmate stylo latiore.

Hab. Adelaide River, North Australia; Rev. T. S. Lea, July, 1886. " White Gum."

Foliorum lamina saepissime 13·0–16·0 cm. long, summum vix totidem lat.; petioli crassiusculi, late canaliculati, sursum anguste alati, 4·0–4·5 cm. long. Pedunculi circa 0·6 cm. long., 0·35 cm. diam. Alabastra 1·2 cm. diam. Calycis tubis 0·7 cm. long., summum 1·2 cm. lat., una cum operculo nitens et eleganter rugatus. Operculum 0·5 cm. long., 1·0 cm. diam. Stamina 1·2 cm. long. filamenta in sicco aurantiaca; anthera 0·1 cm. long. Capsula. . . .

Near *E. platyphylla* R.Br. and *E. alba* Reinw. The leaves are almost exactly those of the former, but in either case the buds and opercula are much smaller than those of *E. pastoralis* and differently shaped. At the British Museum there is a specimen, sent under the name of "*E. alba* Reinw.," by Baron Mueller, which has large flowers with a broad hemispherical very obtuse operculum, almost exactly like that of *E. pastoralis*. This is altogether unlike typical *E. alba* Reinw., and may perhaps be a small-leaved form of the species described above. (*Journ. Bot.* xl, 27 [1902].)

Above (page 91) I have expressed the opinion that this is not sufficiently different from *E. alba*. It is figured at figs. 7–9, Plate 105.

RANGE.

The type comes from Timor. Beyond Australia it occurs also in Java and Papua, but its western limit in Malaysia is unknown. It is for the most part tropical, and while on the mainland of Australia it extends over the north, from Queensland to the Kimberleys and North-western Australia generally, it descends a little south in Queensland, at least as far as Gladstone. It prefers moist grassy valleys, but is not exclusively confined to such areas.

Following are some specimens from extra-Australian localities :—

Timor. Specimen in fruit from Java. Also cultivated in the Botanic Garden, Buitenzorg. Island of Flores (Botanic Garden, Buitenzorg). Port Moresby, Papua (Prof. W. Baldwin Spencer, W. S. Campbell).

North-Western Australia.

Calder River; near junction of Lennard and Barker Rivers; Isdell River, near Mount Barnett Homestead (W. V. Fitzgerald).

Northern Territory.

Paul Foelsche. Port Darwin. Nearly globular buds (see fig. 6b, Plate 105).

1. Young leaf, 12 inches long (Tenison-Woods).

Adelaide River, Northern Territory (Rev. T. S. Lea). Type of *E. pastoralis* S. le M. Moore, and communicated by the Keeper of Botany, British Museum, London. (See figs. 8 and 9, Plate 105.)

Pine Creek Railway (E. J. Dunn). Islands of the Gulf of Carpentaria (R. Brown, quoted in *B.Fl.* iii, 243).

QUEENSLAND.

"*E. alba* Reinw., with *E. platyphylla* F.v.M. as a synonym.

"Bay of Inlets, Endeavour's River. Banks's specimens are not referred to by Bentham. Native name 'Kaikur' (Botany of Cook's First Voyage, Banks and Solander (Britten), p. 38, pl. 116)."

Above is the label of a specimen.

Mr. Britten kindly gave me two specimens, one a Banksian one, corresponding to the Plate, and a second one practically identical, collected by Brown at Shoalwater Bay in 1802. It is labelled :—

"*Eucalyptus populifolia* Banks and Sol. and R.Br. MSS. *E. platyphylla* F.M. ex Benth. Shoalwater Bay, R. Brown, Sept. 2, 1802."

The name *populifolia* is one which at once arises when one views this tree, and it is not surprising that it was adopted by more than one botanist independently. See also above, page 93, while the ordinary person, who professes no botanical knowledge, usually associates it with the Poplar of northern climes.

It is the "Poplar Gum" of Leichhardt, who often refers to it in his "Overland Expedition . . . . to Port Essington," *e.g.* p. 142.

> In one of the glens along the ridges I observed a new Gum-tree, with a leaf like that of the trembling Poplar of Europe, and of a bright green colour, which rendered the appearance of the country exceedingly cheerful. It is a middle-sized tree, of irregular growth, with white bark; but the wood, not being free grained, was unfit for splitting.

"Considerable tracts were covered by the Poplar Gum" (p. 148). At p. 149 he named the Isaacs River, and I have seen a specimen of *E. alba* which bears Leichhardt's label, "The Poplar Gum which forms patches of forest along the Isaacks" (*sic*). The *Isaacs* River is in Northern Queeensland, approximately in 22–23° S. Lat. and 149° East longitude.

> . . . . tracts of fine open forest country, amongst which patches of the Poplar Gum forest were readily distinguished by the brightness of their verdure (p. 153).
>
> The Poplar Gum was more frequent, and we always found patches of fine grass near it; even when all the surrounding Ironbark forest was burnt. (p. 206.)
>
> . . . . Narrow-leaved Ironbark and Poplar Gum grew on the hills, and rich grass everywhere. (p. 250.)
>
> . . . . the left side (of the plain) being sandy, and covered with a very pleasing Poplar Gum forest. (p. 253.)

Following are additional localities for the species :—

"No. 252. In flat swampy ground. Few in dry ridges. Middle size tree. Falling bark like in the *Platanus*. Old bark ashy colour, new, white-yellowish." This is a copy of A. Thozet's label on a Rockhampton specimen.

Grows on flat lands, moist clayey. Also found on the ridge at the Rockhampton Cemetery (J.H.M.).

Thirty miles north of Rockhampton (A. Murphy); "Red Gum," Crescent Lagoon, West Rockhampton (W. N. Jaggard).

"A fairly common tree in the Rockhampton district, growing usually in moist, though not necessarily in swampy places. Large smooth-barked trees, having a pendulous habit, with large poplar-like leaves. Timber soft, red (when newly cut.—J.H.M.) in colour, useless except for firewood, even this of poor quality." Yeppoon (J. L. Boorman).

Thirty-eight miles west of Mackay, Pioneer River, and tree common about Mackay. The young leaves when dry were 12 inches long by 11 inches broad. "On full grown tree the leaves are much smaller, and roundish in shape." (Sid. W. Jackson.)

Port Denison or Bowen (Dallachy); Pandanus Creek (E. B. Yearwood).

"Many buds have double operculum when collected." Townsville (R. H. Cambage, No. 3,801); Reid River, near Townsville (N. Daley).

"Poplar Gum," near Atherton and throughout the north. "Low stunted tree, spreading gnarled branches, white bark, timber grey, very gnarled grain." (H. W. Mocatta, District Forest Inspector.)

Atherton (E. Betche). These specimens (in bud) are in no way different from those of *E. pastoralis*.

Ten Mile, Stannary Hills (R. G. Shearer).

The following localities, not already enumerated, given in *B.Fl.* iii, 243, may be taken in here :—

Fertile pastures on the Burdekin (*Mueller*), Percy Island (*A. Cunningham*), Broad Sound (*Fitzroy*), Bowen River (*Bowman*).

AFFINITIES.

Mueller ("Eucalyptographia" under *E. alba*) compares this species only with *E. platyphylla* F.v.M., a species he later suppresses as synonymous with *E. alba*. It is not an easy species to suggest affinities for. It is a White Gum, and its affinities are most probably to be found amongst other White Gums.

1. With *E. oligantha* Schauer.

In leaf *E. alba* has some resemblance to this species. See Plate 64 of the present work. The anthers are, however, different, and probably the fruit, only at present known, as regards *E. oligantha*, in the young state.

E. oligantha is still imperfectly known.

2. With *E. Mooreana* (W. V. Fitzgerald) Maiden.

The two species were thus compared in *Proc. Roy. Soc. N.S.W.* xlvii, 223.

"The fruits have something in common, and also the juvenile leaves, which are, however, petiolate in *E. alba*. The buds are very different. The mature leaves of *E. alba* are never so lanceolate as those of *E. Mooreana*. *E. alba* is a glabrous, soft, large gum of moist flats, *E. Mooreana* is a crooked glaucous tree of mountain tops."

I am further investigating the affinities of *E. alba*, and will report later.

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Explanation of Plates (104–107).

E. Macarthuri Deane and Maiden.

1. Small juvenile leaves. Paddy's River, Wingello, N.S.W. (J.H.M. and J. L. Boorman.)
2. Juvenile leaves. Wingello. (J. L. Boorman.)
3. Larger juvenile leaves. Camden district. (Rev. Dr. Woolls.)

4*a*. Buds; 4*b*, front view, 4*c*, back view of anther. Wingello. (J. L. Boorman.)

5*a*. Buds; 5*b*, fruits. Near Fitzroy Falls, Moss Vale. (W. Forsyth.)

6*a*. Buds; 6*b*, mature leaf and fruits. Berrima. (J. H. M. and J. L. Boorman.)

E. aggregata Deane and Maiden.

7*a*. Small juvenile leaves; 7*b*, fruits. Wallerawang, N.S.W. (J.H.M.) Both from the type.

8*a*. Large juvenile leaf; 8*b*, front and back view of anther. Wallerawang. (J.H.M. and J. L. Boorman.)

9. Buds and mature leaf. Wallerawang. (A. Murphy.)
10. Fruits with pedicels. Wallerawang. (J. L. Boorman.)

11*a*. Buds; 11*b*, fruits, both slightly larger than those of the type. Berrima. (J. L. Boorman.)

E. parrifolia Cambage.

12*a*. Juvenile leaves; 12*b*, mature leaves, bearing buds in the axils; 12*c*, the same, together with mature leaves becoming lanceolate and alternate; 12*d*, anthers; 12*e*, sessile fruits; 12*f*, pedicellate fruits. All from Kybean River, Monaro, N.S.W., and from co-type specimens. (R. H. Cambage.)

PLATE 105.

E. alba Reinwardt.

1. Portion of the figure of *E. Leucadendron* Rwdt. from De Vriese's "Plantæ Indiæ Bataviæ Orientalis," t. v (1856).
2. Fruits. Island of Flores.

3*a*. Leaf and buds; 3*b*, anthers, from Timor. Note the long lanceolate leaf, resembling that of *E. Leucadendron*.

4. Leaf (? intermediate). Timor.
5. Leaf and fruits. Java.

6*a*. Leaf; 6*b*, buds. Port Darwin. (Paul Foelsche.) From Herb. Melb.

7. Buds drawn from a Port Darwin specimen from Herb. Melb. in British Museum, Nat. Hist. (Botany).

8*a*. Buds, flower and leaf (note the glands on the petiole); 8*b*, anthers from a piece of the type of *E. pastoralis* S. le M. Moore, Adelaide River, North Australia. (Rev. T. S. Lea.)

9. Buds and flower drawn by Miss M. Smith from a type specimen of *E. pastoralis* S. le M. Moore, in the British Museum, under the personal supervision of Mr. Moore.

(Nos. 6-9, with largish, almost spherical buds, are all *E. pastoralis* S. le M. Moore.)

PLATE 106.

E. alba Reinw.—*continued.*

1*a*. Leaf and buds: 1*b*, fruits, being portion of Plate 116 (*A. alba* Reinw.), Ill. of the Botany of Captain Cook's Voyage in the "Endeavour" in 1768–71, by Banks and Solander (Britten, 1901). The drawing by F. Nodder, 1778.

2*a*. Female Brachyscelid galls; 2*b*, galls and male Brachyscelid galls on a leaf from a specimen labelled 336, June, 1846, *E. populifolius* Hook. Ic. t. 879. Sub-tropical New Holland. Lieut.-Col. Sir T. L. Mitchell.

3*a*. Intermediate leaf; 3*b*, mature leaf; 3*c*, immature fruits. Stannary Hills, North Queensland. (R. G. Shearer, through Dr. T. L. Bancroft.) Compare the lanceolate leaves in Plate 105.

4*a*. Juvenile leaf (opposite stage); 4*b*, fruits. Rockhampton, Queensland. (J.H.M.)

5. Portion of a petiole of a leaf, showing small galls on the petioles. Atherton, near Cairns, North Queensland. (E. Betche.)

6. Portion of huge juvenile leaf. 38 miles west of Mackay, Queensland. (Sid. W. Jackson.)

PLATE 107.

E. alba Reinw.—*continued.*

1*a*. Leaf with buds; 1*b*, immature fruits. Atherton, Cairns. (E. Betche.)

2*a*. Bud and flowers; 2*b*, anthers. Crescent Lagoon, near Rockhampton. (W. N. Jaggard.)

3. Leaf and buds. Rockhampton. (A. Thozet.) Labelled *E. platyphylla* F.v.M. by Mueller himself.

4. Fruits. Rockhampton. (A. Murphy.)

5*a*. Leaf; 5*b*, leaf and buds; 5*c*, anthers from Port Moresby, Papua. (W. S. Campbell.)

6. Buds and leaf "*E. platyphylla* F.v.M. (*E. bigalerita* F.v.M.)" Calder River, W.A.

7. Buds and leaf. Isdell River, near Mount Barnett homestead, North-West Australia. (Both W. V. Fitzgerald.)

EUCALYPTUS MACARTHURI DEANE AND MAIDEN (*1–6*).

E. AGGREGATA DEANE AND MAIDEN (*7–11*).

E. PARVIFOLIA CAMBAGE (*12*).

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The following species of Eucalyptus are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets :—

acacioides A. Cunn (xlviii).
acmenioides Schauer (xxxii).
affinis Deane and Maiden (lv).
amygdalina Labill. (xvi).
Andrewsi Maiden (xxi).
Baileyana F.v.M. (xxxv).
Baueriana Schauer (lvii).
Behriana F.v.M. (xlvi).
bicolor A. Cunn. (xliv).
Boormani Deane and Maiden (xlv).
Bosistoana F.v.M. (xliii).
Caleyi Maiden (liv).
capitellata Sm. (xxviii).
Consideniana Maiden (xxxvi).
coriacea A. Cunn. (xv).
corymbosa Sm. (xii).
crebra F.v.M. (liii).
dives Schauer (xix).
fruticetorum F.v.M. (xlii).
gigantea Hook. f. (li).
goniocalyx F.v.M. (v).
hæmastoma Sm. (xxxvii).
hemiphloia F.v.M. (vi).
longifolia Link and Otto (ii).
Luehmanniana F.v.M. (xxvi).
macrorrhyncha F.v.M. (xxvii).
maculata Hook. (vii).
melanophloia F.v.M. (liv).
melliodora A. Cunn. (ix).
microcorys F.v.M. (xxxviii).
microtheca F.v.M. (lii).
numerosa Maiden (xvii).
obliqua L'Hérit (xxii).
ochrophloia F.v.M. (l).
odorata Behr and Schlechtendal (xli).
paniculata Sm. (viii).
pilularis Sm. (xxxi).
piperita Sm. (xxxiii).
Planchoniana F.v.M. (xxiv).
populifolia Hook. (xlvii).
punctata DC. (x).
regnans F.v.M. (xviii).
resinifera Sm. (iii).
saligna Sm. (iv).
siderophloia Benth. (xxxix).
sideroxylon A. Cunn. (xiii).
Sieberiana F.v.M. (xxxiv).
stellulata Sieb. (xiv).
tereticornis Sm. (xi).
virgata Sieb. (xxv).
vitrea R. T. Baker (xxiii).

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Sydney : William Applegate Gullick, Government Printer.—1915.

A Critical Revision of the genus Eucalyptus

BY

J. H. MAIDEN, F.L.S.

(Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney).

Vol. III. Part 6.

Part XXVI of the Complete Work.

(WITH FOUR PLATES.)

"Ages are spent in collecting materials, ages more in separating and combining them. Even when a system has been formed, there is still something to add, to alter, or to reject. Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages. In these pursuits, therefore, the first speculators lie under great disadvantages, and, even when they fail, are entitled to praise."

MACAULAY'S "ESSAY ON MILTON."

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CXXXVIII. Eucalyptus Perriniana F.v.M.

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DESCRIPTION.

CXXXVIII. E. Perriniana F.v.M.

In Rodway, *Pap. and Proc. Roy. Soc. Tas.*, p. 181 (1893).

FOLLOWING is the history of this species as given by me in *Proc. Roy. Soc. N.S.W.* xlviii, 428 (1914) :—

The plant which was afterwards known as *E. Perriniana* was first shown in leaf only without fruits by the late Mr. G. S. Perrin* before the Australasian Association for the Advancement of Science. Although he surmised it might be a new species, he simply referred to it as " Specimen No. 2," and stated that the leaves are always perfoliate in young or old specimens (which was not correct as regards mature leaves if that is what he meant).

Soon after, the plant was named *E. Perriniana* by Mueller, as Mr. Perrin verbally informed me on more than one occasion. I believe the naming took the form of distributing the plant with written notes about it. Mueller was sometimes a law to himself in such matters.

Rodway, so far as I am aware, and doubtless with Mueller's sanction, first printed† the name *E. Perriniana* F.v.M. The leaves are at first " all opposite, connate and orbicular," later they become " alternate, petioled and lanceolate."

Then we have *E. Gunnii* Hook. f., var. *glauca* Deane and Maiden.‡ This description includes specimens of *E. Perriniana* (Snowy Mountains) and at least one other species.

Deane and Maiden, *op. cit.* xxvi, 135 (1901), state that var. *glauca* is identical with *E. Perriniana* F.v.M., and quote Rodway (letter of 27th March, 1900) as stating that *E. Perriniana* is " a very luxuriant young growth of *E. Gunnii*."

Op. cit. xxvi, 563, I observed that " variety *glauca* (of *Gunnii*) should not be maintained, and it and *E. Perriniana* should be simply placed under *E. Gunnii* Hook. f., they being not sufficiently removed from the type.

Messrs. Baker and Smith describe§ *E. Perriniana* F.v.M. and arrive at the conclusion that " Morphologically they (*E. Gunnii* and *E. Perriniana*) are distinct, whilst *E. Perriniana* is identical with the tree growing at Tingiringi Mountain, N.S.W."

In the following year Rodway|| again speaks of *E. Perriniana* as growing into the typical *E. Gunnii*.

Baker and Smith¶ claim the species on the ground that it had not been described before they had done so in 1902. Rodway's account of it in 1893 is available to anybody, and if that first meritorious though not complete description be brushed aside, then the number of Eucalyptus descriptions which must also be abandoned on similar grounds would be very many. I have touched upon** this point already, which is one apart from the question as to whether *E. Perriniana* is a valid species or not. (I believe it is.)

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* *Rept. Aust. Assoc. Adv. Science*, ii, 557 (1890).
† *Pap. and Proc. Roy. Soc. Tas.*, p. 181 (1893). In his " Tasmanian Flora," p. 58, he distinctly states that Mueller suggested the name.
‡ *Proc. Linn. Soc. N.S.W.*, xxiv, 464 (1899), with Plate xlii, figs. 5-7.
§ " Research on the Eucalypts," 205 (1902).
|| " The Tasmanian Flora," p. 58 (1903).
¶ *Pap. and Proc. Roy. Soc. Tas.*, p. 163, 1911 (1912).
** *Op. cit.*, p. 26 (1914).

It may be described in the following words :—

Straggling, small, glaucous White Gum of 15–20 feet, with the usual lenticular patches on the bark. Not a Mallee. Timber pale.

Juvenile leaves perfoliate.

As regards the leaf-base we have various stages of (1) the auriculate, and (2) amplexicaul, through the (3) connate to the (4) absolutely perfoliate.

Flowers in threes. Operculum much shorter than the calyx-tube, hemispherical; the colour, which is very marked, is yellow to orange and red.

Fruit nearly hemispherical to obovate-truncate, rim not expanded, sometimes slightly constricted.

SYNONYMS.

1. *E. Gunnii* Hook. f., var. *glauca* Deane and Maiden (in part).
2. *E. Gunnii* Hook. f., var. *montana* Hook. f.
3. *E. ligustrina* DC. (*teste* Hook. f.).

1. *E. Gunnii* Hook. f., var. *glauca* Deane and Maiden.

Described in *Proc. Linn. Soc. N.S.W.* xxiv, 464 (1899), so far as the Snowy Mountains specimens from both New South Wales and Victoria are concerned.

2. *E. Gunnii* Hook. f., var. *montana* Hook. f.

Bot. Mag. t. 7808 (excluding figures 3 and 4). "Arbor parva, foliis ad 2 poll. longis, umbellis paucifloris."

Synonym quoted, *E. ligustrina* Miq., non DC.

I cannot see in what character (fruits are, however, not shown) this variety differs from *E. Perriniana*. Sir J. D. Hooker did not quote the origin of his plant (he probably did not know it) so that we have not the opportunity of tracing its affinities from its locality. *E. Perriniana* was unknown to him, but the distinguished botanist made a real discovery in separating it from typical *Gunnii*.

3. *E. ligustrina* DC.

E. ligustrina Miq. non DC. is referred to in *Ned. Kruidk. Arch.* iv (1856), 134, as follows :—

"24. *Eucalyptus ligustrina* DC., Prod. iii, p. 219, n. 24 (?). Van Diemensland (Stuart)."

Mueller (*Eucalyptographia*) says it belongs to *E. Gunnii*. I have a note that I have seen a specimen labelled "*E. ligustrina* DC., No. 17, C. Stuart, Van Dieman's Land, Miquel, Ned. Kruidk.," but I did not make a note in which herbarium.

RANGE.

It is found in Tasmania, and in the highlands of north-eastern Victoria and south-eastern New South Wales.

It is recorded from the following localities :—

Tasmania.—The Hamilton-Ouse District (L. Rodway).

Victoria.—Dargo High Plains (Dr. Heber Green).

New South Wales.—Snowy Mountains, elevation of 5,000 feet (W. Baeuerlen); Mount Kosciusko, on hill-sides, elevation of about 6,000 feet (J.H.M.).

AFFINITIES.

1. With *E. coriacea* A. Cunn. var. *alpina.*

It is no doubt often passed over as a small *E. coriacea* A. Cunn., var. *alpina,* but the perfoliate juvenile leaves and the venation of the mature leaves at once separate them. *E. coriacea* has reniform anthers.

2. With *E. Gunnii* Hook. f.

This is the species with which *E. Perriniana* has so long been confused and with which it has closest affinity.

As regards the leaf base, we have various stages of (1) the auriculate, and (2) amplexicaul, through the (3) connate to the (4) absolutely perfoliate.

All four forms are seen in *E. Perriniana,* and the first two forms in *E. Gunnii* Hook. f. It remains to be seen if the last two forms (3) and (4) do not occur in *E. Gunnii.* So far I am not always able to separate specimens of *E. Perriniana* showing only (1) and (2) from *E. Gunnii,* but the immature bud of *E. Gunnii* has a peculiarly pointed operculum and the line of demarcation with the calyx-tube a raised rim. The fruit of *E. Perriniana* appears to be smaller as a rule, and uniformly more hemispherical, and the rim thinner than that of *E. Gunnii.*

Figure 11, Plate 83 of my "Critical Revision of the genus Eucalyptus," exhibits the perfoliate leaves of *E. Perriniana* and not *E. cordata* as stated. The record of the locality should be near Hamilton, Tasmania. Mr. L. Rodway informs me he was with the late Mr. R. D. Fitzgerald when he collected it.

DESCRIPTION.

CXXXIX. E. Gunnii Hook. f.

In *Lond. Journ. Bot.* iii, 499 (1844).

Ramulis junioribus floribusque glaucis, foliis alternis petiolatis lanceolatis v. elliptico seu oblongo-lanceolatis rarius ovato-oblongis magis minusve acutis acuminatis v. mucronatis utrinque opacis venis obscuris, petiolis folio subquadruplo brevioribus, pedunculis solitariis axillaribus teretibus trifloris petiolo sub brevioribus, cupulis turbinatis breviter pedicellatis pedunculi longitudine, operculis hemisphæricis cupulæ dimidii longitudine sed latioribus, mucrone valido basi lato terminatis, fructibus latioribus ellipticoturbinatis ore paulo contracto valvis 3–4 interdum porrectis.

Hab. On the elevated tablelands of the interior of Tasmania, especially in the neighbourhood of the lakes (Gunn. No. 1084, 1080, 1082).

As is the case with other species of this most difficult genus, no dependence can be placed on the size of any of the parts or on the form of the leaves. The branchlets are slender, terete, nearly smooth, the younger very glaucous. The leaves, which seldom exceed two inches in length, vary between linear-lanceolate and oblong, but are sometimes broadly ovate, with a mucro; these broader leaves frequently terminate the branches. The peduncles are generally axillary, sometimes lateral, but always solitary, and never more than three-flowered, from 2–4 lines long, stout and patent. Cupulæ exactly turbinate, sessile or generally shortly pedicellate, 1½–2½ lines long, covered with fine glaucous bloom. Operculum less than half the length of the cupula, hemisphærical, tapering on the very summit into a short, stout, erect mucro. Stamens bright yellow. Fruit elliptical, turbinate, broad at the base, 2–3 lines long, about two-thirds broad or rather more, mouth slightly contracted. (*op. cit.*)

It is most usually known as "Cider Gum" for the reason explained below p. 107. It is also known as "Swamp Gum" because it occurs in swampy places at high elevations.

Hooker later describes it in his "Flora of Tasmania" ("Botany of the Antarctic Voyage") 1, 134 (with t. 27) in the following words :—

Eucalyptus Gunnii (Hook. fil. Lond. Journ. Bot. iii, 499); arbor parva, ramulis floribusque glaucis, foliis alternis petiolatis ellipticis ovatis oblongis lanceolatisve acutis acuminatis mucronatisve, pedunculis 3-floris petiolo subæquilongis, calycibus turbinatis breviter pedicellatis, operculo latiusculo conico acuto calyce subbreviore, capsula, obovato-oblonga ore non incrassato, valvis immersis. (*Gunn.* 1080, 1082, 1084, 1963.) (Tab. xxvii.)

Hab. Abundant in alpine districts, elev. 3–4,000 feet, often forming small forests in marshy places, &c., *Gunn*, &c.—(Fl. Nov.) (*v.v.*) (Cider-tree).

Distrib. Alps of South-western Australia, *Mueller*.

A very common but singularly variable small tree, 20–30 feet high, sparingly, irregularly branched, with smooth bark and glaucous foliage, becoming shining in old plants. Sometimes, however, solitary trees may be found of much greater size, and so like *E. viminalis* that without fruit it is difficult to distinguish it from an alpine form of that species. *Leaves* seldom above 2 inches long, of all shapes, from oblong or almost orbicular to narrow-lanceolate, petioled, very coriaceous. *Peduncles* about as long as the petioles, three-flowered. *Calyx* obconic, sessile or shortly pedicelled, sometimes obscurely constricted

above the middle, and approaching *E. urnigera* in form. *Operculum* almost as long as the calyx, broader than it, conical, sharp. *Capsule* size of a pea, obovate-oblong or obovate-obconic, terete, with a narrow, not thickened mouth, and valves sunk below its rim. This well known tree yields the cider of Tasmania, which flows in spring from incisions in the trunk.

Bentham then described it in B.Fl. iii, 246. Mueller in the "Eucalyptographia" figures *E. Gunnii* and notes *E. acervula* Hook. f. as a synonym. In this he was followed by most Australian botanists for a number of years, but they are now generally looked upon as distinct.

Mueller's plate is a composite one, and, as usual, the component twigs are not marked by numbers. The twig to the left with buds and unripe fruits and that to the right, with fruits alone, are *E. Gunnii*. The central and largest twig of the plate, showing buds, flowers, and fruits, and the large juvenile leaf at the back, are *E. acervula* Hook. f. The juvenile leaves at the right hand top corner may be (though it is not typical) *E. rubida*, and the small twig, showing buds, at the left hand top corner, may be an aberrant form of that species.

Turning to the description, it is a mixture of *E. Gunnii* and *E. acervula*, and the same applies to the localities in the next paragraph, and to the general account, which follows. The plate and the description of *E. Gunnii* (so called) are amongst the most unsatisfactory in Mueller's admirable work.

The sap of the tree. *E. Gunnii* is remarkable as being the principal Eucalypt to yield a sweetish sap in abundance. Following is an early account, by Gunn :—

The Tasmanian shepherds and stockmen cut with an axe into the tree about 5 or 6 inches, inclining the cut downwards so as to hold about a pint. The sap flows into this hole from above and below, and when first made fills at least once a day, but later in the season yields less, and ceases altogether. The sap is drunk as it comes from the tree. Some trees yield sap of a very thin consistency and slightly acid, and others again yield a sweeter, and as thick as syrup.

The above is a character of the species, and as such it is inserted at this place; a full account of the sap will appear in my "Forest Flora of New South Wales" (under *E. Gunnii*).

SYNONYMS.

1. *E. ligustrina* Miq. in *Ned. Kruidk. Arch.* iv, 134, but probably not of DC.

Until such time as a properly authenticated specimen is compared with both *E. Perriniana* F.v.M. and *E. Gunnii* Hook. f. one must be content with making the reference.

2. *E. Gunnii* Hook. f., var. *glauca* Deane and Maiden (in part). See *Proc. Linn. Soc. N.S.W.* xxiv, 464 (1899).

RANGE.

It is a tree of the coldest localities, occurring at considerable elevations in Tasmania (the west central districts of Rodway), and on the very highest ones, in contiguous districts, in Victoria and New South Wales.

Tasmania.

Following are the three type specimens quoted in the original description examined by me. They are all from Tasmania of course. See Hooker's *Fl. Tas.*

(*a*) Gunn's 1080–1842. "Marlborough, received as such by R. C. Gunn." To this label has been added later, "Cider Tree, March, 1840." A specimen in herb. Cant. ex herb. Lindl., is in late flower, with neither buds nor fruits. The stalks and foliage have a strong yellow cast. The calyces are glaucous.

(*b*) Gunn's 1084. "Lake Arthur. A tree yielding rich cider. 18/2/43."

The fruits riper and therefore more cylindrical than shown in Hooker's plate. As regards the buds, some of them have pointed opercula as shown at Fig. 1 of the plate; the others have blunt opercula as shown on the main figure. The buds and fruits are alike glaucous.

(*c*) Gunn's 1082. Collected by J. D. Hooker at Marlborough, 17th October, 1840. This agrees with the foregoing, and is, in addition to the two preceding, quoted in *Fl. Tas.* i, 134.

(*d*) Gunn's 1963. The sheet contains two specimens:—

(1) "Foot of late Echo tree." (2) "Uncertain where collected." Both are labelled in the handwriting of Hook. f. In herb. Syd. ex herb. Hook. The fruit is more hemispherical in No. 1963 than in some of the other specimens.

(*e*) Gunn's 1075.

Specimens other than Gunn's are:—

(*f*) Western Mountains (W. H. Archer, January, 1848).

(*g*) Great Western Mountains (L. Rodway).

(*h*) Trees up to 80 feet, diameter 1–3 feet. Basaltic formation, 2,000 feet, Guildford Junction, January, 1911 (R. H. Cambage, No. 2567).

Victoria.

Summit of Mount Baw Baw (Mueller). Mentioned in B.Fl. (iii, 247) as typical. I have seen the specimens examined by Bentham. The fruits have a slightly domed rim, connecting with a very domed Mount St. Bernard form, which I have attributed to *E. rubida* at page 119 below. The Mount Baw Baw specimens are intermediate in character between the type and those from Mount St. Bernard, but all are undoubtedly near the type of *E. Gunnii*.

NEW SOUTH WALES.

Tingiringi Mount (5,400 feet), near Delegate. "Forms a Mallee scrub, but sometimes single trees of 40 feet." (W. Baeuerlen). Usually small leaves; glaucous, very small young leaves. Sometimes glaucous mature foliage. Glaucous twigs, inflorescence and fruits. Capsule sunk when not fully ripe. Points of valves hardly protruding. Fruits in threes.

Wollandibby, Jindabyne (W. Baeuerlen), 12–15 feet; Little Tindery Mountain, Michelago (J. L. Boorman). This brings the range considerably to the north, almost to the Queanbeyan district.

The following specimens show transit to *E. rubida* if only in the cordate-lanceolate juvenile leaves.

Nimbo Station, head of Queanbeyan River. "Flooded or Cabbage Gum"; smooth-barked tree, with reddish-brown flakes (H. Deane).

I am more than ever impressed with the affinity of *E. Gunnii* to some other forms, particularly to *E. rubida*.

AFFINITIES.

1. With *E. Perriniana* F.v.M. to which it is closest allied. See above, page 105.

2, 3, 4, 5. With *E. rubida* Deane and Maiden; *E. maculosa* R. T. Baker; *E. acervula* Hook. f.; *E. camphora* R. T. Baker.

These have been considered to be forms of *E. Gunnii*, and although I no longer look upon them as varieties, the relationships are undoubtedly very close, and will be best understood after the various species have been dealt with, viz.:—*E. rubida* below (p. 121), and the others in the following Part (No. XXVII).

DESCRIPTION.

CXL. E. rubida Deane and Maiden.

Proc. Linn. Soc. N.S.W. xxiv, 456 (1899), with Plate xl.

Vernacular Names.—Known as "Flooded Gum" at Queanbeyan, Michelago, Cooma; sometimes known as "Bastard White Gum," "Ribbony Gum," and "Drooping Gum." The name "Candle-bark" in use in the Queanbeyan district is in reference to its smooth and glaucous trunk; it is very descriptive of the tree as seen in much of its range, and might be adopted for the vernacular, as the others are already appropriated. It has usually reddish or plum-coloured patches on the bark, hence the occasional name of "Spotted Gum." Sometimes the bark is, however, of a yellowish cast (the tips of the twigs being also yellowish), and hence between Goulburn and Moss Vale, it is one of the trees known in the district as "Yellow Gum." We have also noticed the species to have a yellowish bark between Delegate and Bombala, while a label in the National Herbarium, Melbourne, shows that the species at St. Vincent's Gulf, S.A., is also known as "Yellow Gum."

Bark.—Perfectly smooth for the most part, the outer layer of bark falling off in ribbons. The "bole and limbs very white, as if whitewashed" (A. W. Howitt, referring to Gippsland trees). The name "Candle-bark" is also excellently descriptive of the appearance of the bark in the most southern parts of this Colony and in north-eastern Victoria.

It frequently exhibits reddish or plum-coloured patches (hence the specific name); this is a colour rarely, if ever, seen in *E. viminalis*. Sometimes (*e.g.*, Adaminaby to Cooma) the colour of the bark, especially of the branches, may be described as pale pink. We have already referred to the yellowish cast of the bark in widely different localities.

In the case of a species having such an extended range, it is not surprising that the bark shows some variation. For example, the trees about Sunny Corner show perhaps a rougher (more flaky) bark at the butt than is usual in many other localities, but neither here nor anywhere else is such rough bark ever of a fibrous character.

Under *E. Stuartiana*, in the *Eucalyptographia*, the following remarks occur:—"It is possible that in this species a smooth-barked variety occurs, as would appear exceptionally to be the case according to the notes of several collectors." We do not doubt that *E. rubida* is here referred to, and the reasonableness of the confusion with *E. Stuartiana* is referred to below.

Timber.—Red worthless timber; dries paler.

Sucker Leaves.—From nearly orbicular to nearly oblong, often emarginate or retuse, eventually taking on a lanceolate shape. The midrib usually terminating in a short and fine point. Strictly opposite; sometimes stem-clasping and even more or less connate. Very glaucous as a general rule.

Mature Leaves.—Dull green; of similar tint on both sides; narrow lanceolate, of thickish texture and hence largely concealing the oil-dots, the intramarginal vein scarcely removed from the edge, the primary veins roughly transverse. Often glaucous, sometimes very much so. Spherical brachyscelid galls are sometimes found on the leaves.

Buds.—Ovoid, axillary; in threes and cruciform; sessile or with very short stalklets; the stalks commonly under ¼ inch long, round, rarely flattened, and then only towards the insertion of the buds.

Operculum.—Nearly hemispherical when ripe, hardly pointed; rather shorter than the calyx; conoid when less ripe.

Stames all fertile and inflected in the bud, anthers ovate-oblong, with parallel distinct cells.

Fruit.—Top-shaped; spreading at the orifice. Usually about three lines in diameter. Sometimes nearly hemispherical. Shiny or glaucous. The rim broadish and convex. Valves three or four and exserted.

It is also known as "Manna Gum," and it is perhaps the principal species of Eucalyptus yielding that substance.

In *E. Gunnii* we have a sweetish sap, and the present species is an abundant (if not the most abundant) yielder of an inspissated sap known as Manna. This will be referred to under a synonym (below, page 112), *E. mannifera* A. Cunn., of the present species, and I will reserve a fuller account of the Manna until dealing with *E. rubida* in my "Forest Flora of New South Wales."

It was Manna of this species that I supplied to Dr. F. W. Passmore for his exhaustive paper "The carbohydrates of Manna from *E. Gunnii* Hook., and of Eucalyptus honey" (*Pharm. Journ.* (3) xxi, 717).

SYNONYMS.

1. *E. granularis* Sieb. Herb. (quoted by Bentham and also by Mueller).
2. *E. mannifera* A. Cunn.
3. *E. mannifera* Mudie. Doubtless Mudie copied his Latin description from A. Cunn.
4. *E. Gunnii* Miq. (*Ned. Kruidk. Arch.* iv, 126).
5. *E. viminalis* Labill., var. *microcarpa* F.v.M. (*op. cit.*, p. 125).
6. *E. sacchariflua* F.v.M., var. *microcarpa* (?) (Herb. Mueller).
7. *E. fabrorum* Herb. Behr. non Schlecht. (*partim*).
8. *E. viminalis* Benth. non Labill. var. (B.Fl. iii, 240) *partim.*
9. *E. viminalis* Labill., var. b., Howitt (*Trans. Roy. Soc. Vic.* ii, 97 [1890]).
10. *E. Gunnii* Hook. f., var. *rubida* Maiden. *Proc.Linn. Soc. N.S.W.* xxvi, 577 (1901).

I have traced the intricate synonymy of *E. rubida* as well as I could. It is not altogether satisfactory. Original descriptions are sometimes missing, and authenticated material is not always available.

1. *E. granularis* Sieb.

Bentham (B.Fl. iii, 240) refers this to *E. viminalis*. No description of it was ever published (Mueller, in *Eucalyptographia* under *E. viminalis*).

A specimen in Herb. Melb. was collected by Mueller in 1853 at Fifteen-mile Creek, South Australia, and labelled by him "*E. granularis* Sieb., *E. viminalis* Labill., var. *granularis* F.v.M." This specimen is in bud only (in threes) and is *E. rubida*. I have not seen an original of Sieber's.

A second specimen is perhaps a portion of the first :—

"*E. viminalis*, but may be *E. Stuartiana*, var." (F.v.M.'s note); Fifteen Mile Creek, Mueller, 1853, labelled by him "*E. viminalis* Labill., var. *granularis* (*E. granularis*, Sieb.).

1, 5, 6. It will be observed that Miquel described a var. *microcarpa* F.v.M. of *viminalis*. "Ad Fifteen Miles Creek." I have seen an original specimen and it bears the following label—"*Eucalyptus sacchariflua* Ferd. Müller var. *microcarpa* (?) Fifteen Miles Creek, Lofty Ranges (South Australia.—J.H.M.) *E. viminalis* var. *microcarpa*."

The following passages explain the origin of some of the above names :—

(6) *Eucalyptus viminalis* Labill. l.c. p. 12 Tab. 151. DC. *Prodr.* l.c. 218, n. 15.—*E. saccharifera* Ferd. Müller mss. *E. crucivalvis* ej. olim.

In humidis ad Onkaparinga, m. Aug., Beagle (Bugle) range, Lofty Range (South Australia.—J.H.M.) F. Müller.—Tasmania (Stuart n. 7). Arbor procera trunco cinereo albo recto.

β. *microcarpa* F. Müll.—Ad. Fifteen-miles creek.

Folia chartaceo-coriacea elongato-lanceolata e basi latiore sensim angustata, acuminata. Umbellae axillares et laterales triflorae; pedunculus petiolo brevior pedicellis longior; calycis tubus conico-campanulatus operculum hemisphaericum muticum apice conoideo-attenuatum aequans.—Arbor gigantea cortice griseo-nigricante rimoso secendente et truncum laevem cinereum relinquente, coma densiore quam E. longirostris. Suturae valvarum 4 varo (raro) 3 e tubo calycino maturo turbinato-globoso emersae crucem imitantur. Fl. Aestate (Müll. adnot.) (*Miq. Ned. Kruidk. Arch.* iv, 125 [1856]).

In the above quotation two species are involved :—

1. From "6. *Eucalyptus viminalis* . . . . albo recto." This is *E. viminalis* Labill.
2. From "β. microcarpa," to the end. This is *E. rubida* Deane and Maiden.

2. *E. mannifera* A. Cunn.

Allan Cunningham's observations were made on herbarium specimens collected at Bathurst, N.S.W. (now in Herb. Kew), and are as follow :—

Eucalyptus mannifera A. Cunn., operculo hemisphaerico acutiusculo umbellis axillaribus terminalibus 4–6 floris, cortice arboris albo-cinereo. This species of Eucalyptus is very generally dispersed through the country bordering on the Downs of Bathurst, where it forms a tree of irregular growth 30–40 feet high, flowering in the months of August and September, and in very dry, warm weather giving out a sweet juice or sap, which becomes white and concrete by exposure to the atmosphere when it drops to the ground. N.B.—Throughout the late long and painful season of drought (in N.S.W.) to the agriculturist the exudation from this tree has been very considerable, so that so long as the atmosphere continued very dry and not charged with moisture it might be gathered from the ground beneath the tree in a quantity sufficient in a few minutes to fill a pint pot. *The Manna*, as it is called by our Ultramontane *settlers*, thus produced is frequently collected for medicinal purposes, is of a pleasant sweet taste, and not in the least affected by the essential oil, with which every part of the plant abounds. It dissolves immediately in water so that it disappears at once from beneath the trees on the falling of the slightest shower of rain. It is frequently taken by persons at Bathurst as a pleasant purgative, so gentle in its operation that it may be administered to the tenderest infant, the dose for a healthy adult being from 2½ to 3 tablespoonsfull. The timber of the tree is considered useless for the purposes of rural economy and is in consequence only used as fuel. A. Cunningham.

3. *E. mannifera* Mudie.

One species of *Eucalyptus* affords a substance, of which the medicinal properties have been tried in Australia, and which, should it be found to suffer no injury or decomposition during the voyage, might materially reduce the price of manna, which still retains its rank as a medicine.

Until the substance itself, which appears rather difficult to preserve, be laid before the Society for their examination and decision, it may not be altogether useless to offer a few notes on the plant, as even that is but imperfectly known, and has not, it is believed, been figured or described in any scientific work. The following are the characters, and a few points in the description :—

Generic Character of Eucalyptus. Calyx superus, persistens, truncatus ante anthesin tectus. Operculo integerrimo, deciduo. Corolla nulla. Capsula quadrilocularis, apice dehiscens, polysperma.

Natural Order : Myrtaceae.

Specific Name : Eucalyptus mannifera. (Manna gum tree.)

Specific Character : Operculo hemisphærico acutiusculo, umbellis axillaribus terminalibusve 4–6 floris, cortice albo-cinereo.

The principal habitat of this tree is upon the elevated downs into which the Blue Mountains subside and upon the adjoining slopes. It grows to the height of from thirty to forty feet, of irregular growth, and having a number of slender branches. As is the case with almost all the genus, the leaves, which are simple, lanceolate, and entire, are placed vertically, by a peculiar twist of the foot-stalk.

From the accounts given of it, it does not appear that the manna produced by this *Eucalyptus* is very different from that yielded by the *Fraxinus*, on the coast of the Mediterranean; though, as common report describes it as having less of the nauseous taste, it may be less efficient as a medicine. Like the manna of Europe, it is reported to contain a saccharine and a mucous ingredient, both of which are easily soluble in water, and partially so likewise in the atmosphere, when moist. It obviously arises from a rupture in the cortical vessels of the tree, produced not by the puncture of insects, but by atmospheric action, as it is produced only in the dry season, and the quantity varies with the degree and duration of the drought.

Toward the close of a long dry season, it is found so abundant on the ground under the trees, that several pounds may be collected by one person in a few minutes; but when rain begins to fall it melts, and disappears almost as rapidly as snow.

It is worthy of remark that this substance, manna, which is reported as being so similar, as afforded by the Ash of Europe and the Eucalyptus of Australia, and which has not been found, possessing the same qualities, upon any other species of plant, should yet appear to be an exudation of two genera which differ so much in every other respect, and are indigenous only in countries which are distant from each other by nearly half the circumference of the globe; and it deserves further notice, as being one of the few instances of near coincidence in a substance where most of the productions of nature are so dissimilar. (*Trans. Med. Bot. Soc.*, 3, 24 [1834].)

The brief Latin description has been copied from Allan Cunningham's note on his herbarium specimen; the essential part of the description of the manna and its occurrence is also taken by Mudie from the same source.

Walpers' *Repertorium Botanices Systematicæ*, Vol. ii, p. 163 :—

E. mannifera Moudie mss., in *Transact. of the Med. Bot. Society*, iii, 24. Foll. lanceolatis verticillatis integris; operculo hemisphærico acutiusculo; umbellis terminalib. axillaribq. 4–6 floris; cortice albo cinerascente. Crescit in Nova Hollandia.

Bentham (B.Fl. iii, 240), in putting *E. mannifera* A. Cunn. under *E. viminalis* Labill., adds "and perhaps also Moodie: *Walp. Rep.* ii, 163, although incorrectly described."

9. *E. viminalis* Labill., var. (b.) Howitt.

This Eucalypt is sub-alpine, and appears some 700 ft. above sea-level, as at Dargo and Noyang, but somewhat higher on the Wellington River and at Gelantipy. It also grows about Morwell, where, together with *E. pauciflora*, it forms part of the forest, just as it does throughout the alpine and sub-alpine localities which are its special habitat. In the highest tracts, as at Dargo High Plains, it grows to a height of over 100 ft. It has a rather massive bole, with moderately spreading limbs, and fairly full foliage. The bark is smooth and very white, excepting near the ground, where it more or less persists; it has frequently, when about to dehisce, a decided "coppery" tint upon the bole and limbs. The wood is somewhat soft, not very fissile, and resembles that of the lowland form (*E. acervula*, Hook. f.) except that it has a more reddish or pinkish tint. The leaves are lanceolar, slightly falcate, and more or less attenuated at the stalk, the marginal vein is usually but slightly removed, the lateral veins numerous, not very marked, and inclined at about an angle of 40 deg. with the midrib. The umbels are axillary or solitary, and the stalklets about as long as the buds. The buds are ovate, most commonly three in number, and arranged in the cruciform manner so characteristic of *E. viminalis*. The lid is semi-ovate, smooth, and occasionally pointed, but is not mammillated, as is the case with *E. Stuartiana*. Judging by the examples which I have examined, I think the buds of this variety are more broadly ovate, have shorter stalks, and more rounded lids than those of the lowland form. The fruit is semi-ovate, with a somewhat wide and more or less convex margin, and with rather strong deltoid and protruding valves.

These characteristics are those of the typical *E. viminalis*, but the seedlings and young saplings have peculiarities which raise doubts whether indeed this Eucalypt should not rather be referred to *E. Stuartiana*.

The seedlings have round or ovate opposed leaves, which are closely sessile, rarely they are ternary in verticels, the stems as well as the leaves are mealy, and thus resemble very strongly, as also in other respects, the young plants of *E. pulverulenta* as it grows in Gippsland, rather than those of *E. Stuartiana*.

Even when as high as 8 ft. or 10 ft. the saplings still have pulverulent leaves of an ovate form and opposed position, and the grown trees themselves occasionally show a reversion to this structure at the ends of their pendant branches. In some localities, as for instance at Dargo, this tree grows together with *E. Stuartiana*, the latter being in its typical form. When the seedlings and saplings of these trees are thus compared, those of *E. Stuartiana* are found to be much less mealy, to be of thicker consistence, and more pointed than those of this variety of *E. viminalis*, in which the opposed condition of the leaves is continued much longer than in *E. Stuartiana*. There can be no doubt that *E. viminalis* and *E. Stuartiana* are nearly allied, and it becomes necessary now to inquire to which of these this Eucalypt stands nearest. *E. viminalis* differs from *E. Stuartiana*, as I have observed them to be in Gippsland, by having much smaller limbs as compared to the bole. The leaves of the former are smaller, as a rule, more attenuated at the stalk, of thinner consistence and lighter colour. The marginal vein is less distant, the lateral veins more numerous, nearer together, and more obscure. The angle formed by the lateral veins, with the direction of the midrib, is greater in *E. viminalis* than in *E. Stuartiana*.

The mean of a considerable number of measurements gave 10 deg. more for the former than the latter. In the greater number of cases the umbels of *E. viminalis* are three in number, arranged in a cruciform manner, while those of *E. Stuartiana* are more numerous and not so arranged. The buds of *E. viminalis* are more ovate, with a rounded, or at most, minutely pointed lid; those of *E. Stuartiana* are distinctly pointed, or even mammillated. The stalklets of *E. viminalis* are, as a rule, shorter, particularly in the mountain form, although in some cases those of the lowland forms are as long, or longer, than those of *E. Stuartiana*.

The fruit of *E. viminalis* is more ovate than that of *E. Stuartiana*, with a rim, which is always more or less convex, or frequently strongly so.

Especially is this the case in the lowland form along the river courses, but is less so in the mountain form.

In the mountain form the fruit is usually more hemispherical than in the lowland variety, with a convex vertex, and the valves somewhat weaker, although protruding. It is in those examples which grow at the highest altitudes, as, for instance, the Dargo High Plains, 4,500 ft., that I have observed the form of the fruit to resemble that of *E. Stuartiana*, and in these the fruit is semi-ovate, the rim not very wide,

and the valves, although exserted on the whole, have their insertions placed a little below the level of the rim. Yet, on examining the fruit from a number of trees, I observed that there was a considerable variation in that of the same tree. While some agree with this description, others have the protruding convex rim and exserted valves of the typical *E. viminalis*.

In the variety which I am now considering, it must be noted that the habit of growth, and the character of the wood, is that of *E. viminalis*, and not of *E. Stuartiana*. Although the cortical character is not of much value, the character of its bark places it among the *Leiophloiæ*.

This tree is the manna-producing Eucalypt of the mountain country. The manna is produced as plentifully, in the same manner, and of the same kind, as that produced by the typical *E. viminalis*.*

I must note, in this connection, however, that I have found small quantities of manna indistinguishable from that of *E. viminalis*, either by appearance or taste, attached to slight injuries on leaves of saplings of *E. Stuartiana* at Toongabbie.

The difference between this Eucalypt and the typical form of *E. viminalis* lie almost entirely in the form of the leaves of seedlings and young plants, and in their pulverulent character. In general appearance these certainly resemble the young plants of *Stuartiana*, but even more those of *E. pulverulenta*, as found in Gippsland.

Having to choose between *E. viminalis* and *E. Stuartiana*, I have, after weighing all these considerations, assigned it to the former, notwithstanding the strong presumption which arises to the contrary from the extreme departure of its seedlings from the typical form.

It seems not only to connect *E. viminalis* and *E. Stuartiana*, and thus to strengthen the alliance which, as Baron von Müeller points out, exists between these Eucalypts, but also to connect these two with *E. pulverulenta*, in some variety of which I have observed the fruit to have a protruding margin and exserted valves.†—Howitt, in *Trans. Roy. Soc. Vict.*, ii, 97 (1890).

RANGE.

It is found in the States of South Australia, Victoria, Tasmania, New South Wales, and Queensland.

It is primarily a cold country species, occurring from end to end of the eastern portion of New South Wales, and but rarely descending below 2,000 feet. It occurs on the lower slopes of the Mount Kosciusko Range and ascends to about 5,500 feet. On other mountain ranges and spurs in the south-eastern part of the State it ascends nearly as high. In New England and the spurs and higher slopes arising from it, it is common, and extends into Queensland as far as the Stanthorpe district.

The type form came from the sides of dry hills in southern New South Wales, but it is not uncommonly found in low-lying situations and over a considerable area in that and other States. It is not surprising, therefore, that considerable variation is observable in the species, and this is particularly seen in its northern range. In northern New South Wales it becomes a larger, straighter tree, with coarser leaves, flowers, and fruits.

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* When travelling through the Morwell district, where this tree forms part of the forest, some school children, whom I requested to point out the "manna gum," indicated this tree, saying that in December the ground under the tree was white with manna. (Howitt.)

† The difference in the young plants of the lowland and mountain forms of this Eucalypt, are little, if any, greater than those which I observed exist in the young forms of the two varieties of *E. leucoxylon*, which grow in the neighbourhood of Heathcote.

The smooth-barked variety, locally known as spotted box, has in its young form, ovate, opposed, somewhat mealy leaves. The rough-barked form—the Ironbark—has opposed leaves only in very young seedlings. *(Ib.)*

Its name of " Flooded Gum " indicates the low-lying localities in which it may often be found.

In Victoria it principally occurs in Gippsland, but it extends to the Melbourne district and further west and south.

In South Australia it is found in the Mount Lofty Range, and further localities other than those indicated should be sought for.

As regards Tasmania it is recorded from the eastern part of the island, and its range requires further investigation.

NEW SOUTH WALES.

Southern Localities.—Bole and limbs very white as if whitewashed. Pirich (*sic*) Swamp Creek on road from Tubbut (V.) to Delegate, N.S.W. (A. W. Howitt); between Delegate (N.S.W.) and Bonang (V.) (W. Forsyth).

Delegate (W. Baeuerlen). Two specimens (1) marked " smooth bark," and (2) " with the rounded juvenile leaves," were labelled by Mueller *E. viminalis* and *E. Stuartiana* respectively, and these determinations are very instructive. The species, especially when mature leaves only are available, cannot, in the present state of our knowledge, be distinguished from *E. viminalis*, while the juvenile leaves resemble those of *E. Stuartiana* a good deal. Near Delegate Hill, also Merambego (W. Forsyth); Brown's Camp, Delegate (W. Baeuerlen); Mt. Kosciusko, up to 5,500 feet (J.H.M.); Jindabyne, the type (J.H.M.); Wollandiby, Jindabyne (W. Baeuerlen); " Manna Gum," Boloco, Dalgety (A. M. N. Rose); called " Spotted Gum " at Dalgety, Snowy River (A. W. Howitt), a term more commonly applied to *E. maculosa*. Dr. Howitt's specimens of juvenile foliage are as narrow as those of *E. maculosa* ever are.

Following is the reference in *Ned. Kruidk. Arch.* iv (1856), 126 :—" 8. *Eucalyptus Gunnii* J. D. Hook., *Lond. Journ. Bot.* iii, p. 499. Strzlecki Range (F. Mueller). Forma normalis exstat et alia abludens umbellis 5-floris." I have seen the specimen in Herb. Kew; it has four flowers. It is *E. rubida*.

Yellowish smooth bark, a little ribbony, Delegate to Bombala (J.H.M.); Quiedong, Bombala (W. Baeuerlen); Bombala (J.H.M.). Mr. Ronald Campbell, of Cambalong, says it is the common " Spotted Gum " of the Monaro. It is an entirely valueless timber. It usually has a clean stem for a considerable distance up. I was informed that stock are very fond of the leaves; collateral evidence of its affinity to *E. Gunnii*.

Nimitybelle (J.H.M.); Kybean, north-east of Nimitybelle (R. H. Cambage, No. 2018).

Juvenile leaves oval and also lanceolate, Cooma (J. L. Boorman). On gneiss formation, Cooma (R. H. Cambage, No. 1834); bark smooth on the branches, often pale pink, Adaminaby to Cooma (E. Betche). " Spotted Gum," Yarrangobilly (W. W. Gillespie); Yarrangobilly Plateau (A. W. Howitt); Laurel Hill, Tumberumba (R. H. Cambage, Nos. 847 and 865); Bago Forest Reserve (W. W. Nowland).

" Flooded Gum," Michelago (H. Deane); " Flooded Gum," Rob Roy (H. Deane); " Candle Bark," " Spotted Gum," " Flooded Gum," Queanbeyan (H. Deane); Gidley, Bungendore (W. Forster Rutledge); " Monga," Braidwood (W. Baeuerlen).

" Bark whitish smooth, with strips coming off trunk except about 8 feet from ground where bark is fairly persistent, blackish, hard, rough, corrugated, about 80 feet or more." Goulburn (Rev. J. W. Dwyer).

" Manna Gum," Yass and Gundaroo (Rev. J. W. Dwyer); " White Gum." Timber considered very inferior. Close to creeks, Yass Junction (W. M. Carne).

Smooth bark on quartz porphyry. Flowering in the broad-leaved stage. Kangiara, 14 miles north of Bowning (R. H. Cambage Nos. 2203 and 2204). Reminiscent of *E. cinerea* and *E. præcox*.

" No. 6, smooth yellow bark, rough near ground, Wingello; Mrs. Louisa Calvert " (about 1864).

White Gum, Miss Atkinson (afterwards Mrs. Calvert), Berrima, Herb. Melb.

Both of these are multiflowered and nearest *rubida*, but one of the numerous forms connecting with *maculosa*.

" Cabbage Gum," Marulan (A. Murphy), with small fruits in threes and glaucous; " Red Gum," Wingello (A. Murphy); " Yellow Gum," Barber's Creek and Wingello, including Paddy's River. The juvenile foliage varying from the normal to broadly lanceolate (J.H.M. and J. L. Boorman). Wombeyan Caves, Taralga Road (R. H. Cambage and J.H.M.).

Western Localities.—In gullies about Blackheath, Mount Victoria, and the highest parts of the mountains. The leaves depart a little from the type. Leaves in young trees often large, drooping and undulate. With twigs of absolutely mature foliage and with the buds, as they are in threes, we doubt if anyone, in the absence of fruits (and perhaps with difficulty then), can differentiate this species from *viminalis*. Of course with juvenile leaves the matter is easy.

Smooth-barked trunk and branches. Bark falling off in patches. Multiflowered. Fairy Dell, Mt. Victoria (J.H.M.). Similar specimens from Blackheath, and from both localities, flowers also in threes. Mt. Victoria, Lowther Road, Kanimbla Valley (J.H.M.); Jenolan Caves (J.H.M. and W. F. Blakely). Very broad and large young leaves. In threes, " Cabbage Gum," bark very smooth and patchy; colours slaty-blue and white. A common form on the Dividing Range between the Caves and Edith, also at Oberon. Always stunted on the tops of the ridges.

At Wallerawang *E. rubida* is a *viminalis*-looking tree, rather drooping and with ragged ribbony bark. On flats *E. rubida* has very red and ribbony bark here, and there is no doubt that the original description of *rubida* must be modified as to the bark. It is not smooth in all localities, but ribbony sometimes. In this locality it would not be taken for a " White Gum." It is either a ribbony (or even densely ribbony) Gum, with a rough *saligna*-like or even scaly bark at butt, and a red patched trunk. In some places in the district it is more a White Gum, but in drier localities. It sometimes has manna on it

Mt. Blaxland to Rydal (R. H. Cambage and J.H.M.); " Blue Gum," " Drooping Gum," Tarana (A. Murphy).

" Ribbony Gum "; large trees on flats. Distinguished from Red Gum (*tereticornis*) by the ribbony base and the cleaner grain of the timber. Base of stem of a bluish colour, with patches of a darker green. In threes. A coarse form of the species; Wattle Flat, Sunny Corner (J. L. Boorman).

" A large Blue Gum similar in appearance to *E. saligna* and quite as large. Grows in the vicinity of Sunny Corner and the tributaries of the Turon generally, near creeks and in flat country " (A. Murphy).

In the Capertee Valley *E. rubida* has flowers in threes and with yellowish pointed buds. At Capertee I found several typical trees with several flowers in fours and a few in fives. Further examination of trees in some other parts of the State shows that (like normal *viminalis*) normal *E. rubida* has usually flowers in threes but not constantly so. When the buds are taken from a dead branch they have a shiny appearance and are of a pinkish or pale-red colour, not easily described, but apparently a useful character for classification purposes.

I observed *E. rubida* and *E. viminalis* growing alongside at Ben Bullen, Mudgee line. Both have ribbony trunks, and the colouration of the trunks and the habit of the trees are exactly the same. I can find no difference between them except of a botanical character.

Hargraves, multiflowered, and often glaucous (R. H. Cambage, J. L. Boorman, A. Murphy).

Rockley Road, 16½ miles from Bathurst (R. H. Cambage); Blayney, glaucous (J.H.M.); Little River, near Burraga (R. H. Cambage).

Top of Canoblas, Orange (R. H. Cambage, J.H.M., J. L. Boorman). This is an intensely glaucous form, the operculum larger in proportion to the calyx, the valves well exserted. It has the sharp *Gunnii* rims to the buds.

This specimen (a good deal similar to Kangiara, Bowning) connects typical *Gunnii* and *E. rubida* excellently. It has the fruit and other characters of *rubida*; on the other hand it is unmistakably allied to *Gunnii*, and an additional instance of how protean the species is. Orange and Millthorpe (A. W. Howitt); Forest Reefs, Orange (R. H. Cambage).

Northern Localities.—" White or Grey Gum," 14 feet girth, 150 feet high, with barrel of 60 feet. Forest Reserve No. 1,541, Parish of Nundle (No. 8, M. H. Simon).

Foliage coarse, as is common in northern trees, approximating to *E. acervula*. The buds reminiscent of those of *E. goniocalyx* F.v.M. The northern trees are usually larger than those in the south, better grown, with straighter timber.

" White Gum," tall, white-barked tree, running to as much as 60 feet without a limb, straight, but inferior timber. F.R. 2,700, Parish Bundulla, County Pottinger, tableland, black soil. (No. 27, M. H. Simon.) Mr. Simon also sends it from Swamp Oak, Parish Vernon, County Parry.

Multiflowered, smooth, white, powdery bark to ground. Mt. Lindsay Station, Nandewar Mts., 3,200 feet (No. 2,348, R. H. Cambage).

Perfectly smooth trunk, with plum-coloured patches. Multiflowered, 17 miles east of Walcha (J.H.M.).

Multiflowered, up to 7 in umbel. Plentiful at 11 miles from Guyra on Tingha Road, also on basalt at Guyra (Nos. 1003 and 1004, R. H. Cambage). Reminiscent of *E. viminalis*.

Three-flowered, Kangaroo Camp to Guyra (J.H.M. and J. L. Boorman).

" White Gum " of the Gwydir (Leichhardt).

" Ribbony Gum," Ben Lomond (J.H.M.); " Flooded Gum," Glen Innes (H. Deane); very coarse juvenile foliage, and also mature foliage. Near Bolivia, and just west of the Dividing Range (J.H.M.); Bluff River near Tenterfield (H. Deane); " Ribbony Gum," not to be confused with the local " Manna Gum." Large, tall trees. Multiflowered. Wallangarra (J. L. Boorman). Very coarse foliage. Multiflowered White trees, Stanthorpe Road, Wilson's Downfall (No. 2834, R. H. Cambage).

QUEENSLAND.

From Wallangarra, at least 3 miles over the Queensland border (J.H.M. and J. L. Boorman).

VICTORIA.

Mount St. Bernard (J.H.M.). A glaucous tree; fruits in threes, and slightly urceolate; the domed valves somewhat exserted, the fruits nearly truncate when not quite ripe; long undulate leaves; sucker leaves nearly orbicular. The same from Wentworth River (A. W. Howitt).

The large leaves show transit to *E. acervula* ; the domed rim of the fruit is remarkable.

Bright. Flowers sometimes more than three (J.H.M.).

The following specimens of the above were kindly communicated by the late Dr. Howitt :—Grant (W. H. Morgan); Squirrel Forest; Dargo; Monsell; " Cabbage Gum," Woorgellong (O'Rourke); Bullarte; Benalla; " Cabbage Gum," Blanket Creek; Eight Mile Swamp, Port Road; Alexandra Road; Orr's Creek; Morwell.

The following refers to Mr. A. W. Howitt's *E. viminalis*, var. β. in *Trans. Roy. Soc. Vict.* ii, 97 (1890).

The second variety, known as " Cabbage Gum," grown specially in the mountains and high alpine regions, where it attains great size. It also occurs north of the Great Dividing Range in the valleys, on rising grounds of the Ovens, Goulburn, and other rivers. This tree has everywhere a deservedly bad name as being easily decayed, but it might possibly, where other timber is scarce, be used under some other name.

" White Gum," Cobungra River on new road from Omeo to Glen Wills, and throughout the neighbourhood between Omeo and Glen Wills at about 2,000 to 3,000 feet above sea-level. (H. Hopkins).

"*Euc. viminalis*, transit to *Stuartiana*, Beechworth (Falck)." Fruits more pear-shaped and domed than usual. Multiflowered as regards buds; the fruiting specimens in threes. The buds are pointed.

The following are multiflowered forms. Pedicels rather long.

Asylum, Beechworth (A. W. Howitt). "Buds very commonly 7 or less—*E. viminalis*, Walhalla Road" (A. W. Howitt), shows transit to *E. acervula*.

Howitt's *viminalis* var., Tarra Ranges and Ararat (A. W. Howitt), same as preceding.

Waterloo and Beaufort (A. W. Howitt).

"White Gum," Eltham, near Melbourne, Mining Department No. 17c (Herb. Melb.).

"White Gum" multiflowered specimens, with unusually small leaves, from the Dandenong (Gessner).

Ringwood (R. H. Cambage). "*Euc. Stuartiana*, formerly labelled *Gunnii* Barwon, 1853" (Mueller); Warrandyte, 1880 (C. Walter). Both the latter multiflowered and nearest to *E. rubida*, but connecting with *E. acervula*.

"Some trees I have seen are about 60 feet high, stem 2 to 3 feet through, smooth bark, whitish and spotted like *E. goniocalyx*, coming off in the season in long ribbons, the branchlets dark reddish. To my mind the prettiest gum-tree in Victoria." Christmas Hills, Mooroolbark, Wandin, Healesville, Kilmore Junction (P. R. H. St. John).

Macedon (A. W. Howitt).

"Perfectly smooth white trunk, no rough persistent bark on it, even at the base. I have noted this form in the Gippsland Ranges and in the valley of the King River." Near Castlemaine (J. Blackburne).

Tasmania.

The Tasmanian forms seen by me are from the eastern part of the island. The forms have flowers in threes and more than threes, and are not typical. They have been referred to as "broad-suckered *viminalis*." While the Tasmanian specimens are referred by me to *E. rubida* without doubt, it is desirable that the range of the species and amount of variation in Tasmania should be further inquired into.

Beltana, Hobart (R. H. Cambage and J.H.M.); Risdon Cove (J.H.M.); New Norfolk (E. Cheel).

Back River (L. Rodway). Mr. Rodway says it has rather a wide distribution in Tasmania on dry hills.

Messrs. R. H. Cambage and E. C. Andrews state that they observed *E. rubida* between Conara and St. Mary's near the latter, but as they were in a train they could not collect specimens.

Mr. Walter Gill informs me that he collected a little broken material from a dry fallen limb when in company with Colonel Legge at Cullenswood. "This material gave me sufficient evidence to show that this tree is the same as those that grow here (near Adelaide). I took a photograph which turned out poorly, but I am quite satisfied that the trees are the same as those known here as *E. rubida*."

South Australia.

The following specimens were obtained from Mr. Walter Gill, Conservator of Forests, S.A.

(*a*) Kuitpo, near Willunga.

(*b*) Near Ambleside Railway Station and other places on the Onkaparinga River; Balhanna.

I have also seen a specimen labelled "Yellow Gum," St. Vincent's Gulf (Mueller).

Aldgate, large trees near water (R. H. Cambage and J.H.M.).

AFFINITIES.

1. With *E. Gunnii* Hook. f.

Its most obvious similarity to *E. Gunnii* lies in the fact that it is a smooth-barked Gum with broadish juvenile leaves; it may at once be distinguished from that species by the flowers (an arrangement of threes seems to be a constant character of *E. Gunnii* as far as known) and usually narrower though longer mature foliage.

The buds of *E. Gunnii* usually have the operculum only half the length of the calyx-tube. The leaves of *E. Gunnii* are eaten by stock, and the tree produces "cider"; from the leaves of *E. rubida* "manna" exudes abundantly.

2. With *E. Perriniana* F.v.M.

The affinities of these two species are less strong. The juvenile leaves of *E. rubida* are never perfoliate, nor are the fruits so hemispherical. *E. rubida* is a much larger tree.

3. With *E. acervula* Hook. f.

There are connecting links between the normally multiflowered *E. acervula* and the normally three-flowered *E. rubida*. Leaves, buds, fruits are all variable. Instances of this variation have been given already; additional ones will be cited.

I have observed *E. rubida*, *e.g.*, at Wallerawang, with hard, black bark for 10 feet up. At other times it is ribbony right up the trunk and all over. Normally *E. rubida* is a White Gum. The differences will be better understood when *E. acervula* is reached in Part XXVII.

4. With *E. viminalis* Labill.

It resembles *E. viminalis* in its drooping foliage, flowers in threes, and smooth bark. It has long been confused with *E. viminalis*, *e.g.*, it is Howitt's *viminalis* (*b*). See "Eucalypts of Gippsland," p. 97, to which excellent account of the tree the student should turn, its affinities to *E. viminalis* and *E. Stuartiana* being there clearly indicated. It sharply differs from *E. viminalis* in its broad glaucous suckers. *E. viminalis* will be dealt with in Part XXVIII.

5. With *E. cinerea* F.v.M.

Sometimes *E. rubida* flowers in the broad-leaved or juvenile stage, *e.g.*, Kangiara, *via* Bowning, figure 7a, Plate 110. In this case its resemblance to *E. cinerea* F.v.M. (see figures 1b and 5, Plate 89, Part XXI of the present work) is so great as to be striking. But *E. cinerea* has a rough fibrous bark, while *E. rubida* is a gum; there are other differences.

Explanation of Plates (108–111).

PLATE 108.

E. Perriniana F.v.M.

1*a*. Juvenile leaves in the perfoliate stage; 1*b*, just united at base; 1*c*, free, yet still opposite; 1*d*, mature leaf; 1*e*, buds,—note the shape of the operculum, and also its comparative shortness as compared with the calyx-tube; 1*f*, front and back views of anthers; 1*g*, fruit, nearly hemispherical in shape. Not far from the hotel at Mt. Kosciusko, N.S.W. (J.H.M.)

E. Gunnii Hook. f.

2*a*, 2*b*, 2*c*. Mature leaves, buds, and early fruits, being portions of Hooker filius's Plate xxvii, Vol. 1, *Flora of Tasmania*, of his species *E. Gunnii*.

3*a*. Mature leaf; 3*b*, buds; 3*c*, front and back view of anther. Gunn's No. 1080, "Cider Tree." Marlborough, Tasmania. J. D. Hooker (Hook. f.), 1840. This is a co-type of the species, see page 108.

4*a*. Mature leaf (somewhat ovate); 4*b*, buds, opercula rather longer than usual; 4*c*, fruits, with valves somewhat exserted. Gunn's No. 1082. Same locality and collector as 1080, and a co-type of the species.

5*a*. Fruits with valves not exsert; and 5*b*, fruits with valves exsert. Gunn's No. 1084. Lake Arthur, Tasmania. "A tree yielding rich cider." 18th February, 1843. Co-type of the species.

6*a*. 6*b*. Juvenile leaves. Great Western Mountains, Tasmania. (L. Rodway.)

7*a*. Broad mature leaf; 7*b*, juvenile leaf; 7*c*, buds. Guildford Junction, Tasmania. (R. H. Cambage, No. 2567.)

8*a*. Mature leaf; 8*b*, buds; 8*c*, fruits. Summit of Mt Baw Baw, Victoria. (F. von Mueller. Seen by Bentham.)

PLATE 109.

E. Gunnii Hook. f.—*continued.*

1*a*. Young buds; 1*b*, leaf and fruits; 1*c*, domed fruits. Tingiringi Mountain, N.S.W. (W. Baeuerlen.)

E. rubida Deane and Maiden.

2*a*. Juvenile leaves; 2*b*, mature leaves; 2*c*, buds; 2*d*, immature fruits. New Norfolk, Tasmania. (E. Cheel.)

3*a*. Coarse and acuminate juvenile leaves; 3*b*, coarse mature leaf; 3*c*, buds; 3*d*, fruits not quite mature. Mt. St. Bernard, Victoria. (J.H.M.)

4*a*. Buds; 4*b*, large fruits with exceptionally domed rims. Wentworth River, Gippsland, Victoria. (A. W. Howitt.)

5*a*. Buds; 5*b*, fruits. Benalla, Victoria. (A. W. Howitt.)

6*a*. Orbicular juvenile leaves; 6*b*, acuminate, petiolate, juvenile leaves, reminiscent of those of *E. ovata* Labill. Kilmore Junction, Victoria. (P. R. St. John.)

7*a*. Buds; 7*b*, fruits from the drawing of the type, plate xl, *Proc. Linn. Soc. N.S.W.* xxiv, 456 (1899); 7*c*, juvenile leaves from a specimen of the type. Jindabyne, N.S.W. (J.H.M.)

8. Narrow, acuminate leaves. Compare 6*b* and 15*d*. Cooma, N.S.W. (J. L. Boorman.)

9. Fruits with domed rim. Compare 4*b*, Brown's Camp, Delegate. (W. Baeuerlen.)

10. Domed fruits. Yarrangobilly. (W. W. Gillespie.)

11. Fruits in young stage, showing persistent style. Parish Jibean, County Buccleuch, N.S.W. (W. V. Nowland.)

12. Fruits. Gundaroo, N.S.W. (Rev. J. W. Dwyer.)

13. Oblong, narrowish juvenile leaves; there were other shapes on this tree. Quarry Hills, Wingello, N.S.W. (J. L. Boorman.)

14. Buds, multiflowered. Wingello. (Mrs. Calvert.)

15*a*. Fruits (more than threes); 15*b* (in threes), both with valves well exsert; 15*c*, broad, sessile, acuminate juvenile leaves; 15*d*, narrow pedunculate acuminate juvenile leaves. Paddy's River, Wingello. (J. L. Boorman.)

PLATE 110.

E. rubida Deane and Maiden—*continued.*

1*a*. Juvenile leaves, scarcely acuminate; 1*b*, larger juvenile leaves acuminate; 1*c*, mature leaf; 1*d*, buds (more than threes); 1*e*, fruits. Fairy Dell, Mt. Victoria. (J.H.M.)

2*a*. Juvenile leaves, acuminate; 2*b*, buds in threes; 2*c*, fruits. Capertee. (J. L. Boorman and J.H.M.)

3. Coarse juvenile leaves. Fruits in threes. Jenolan Caves. (W. F. Blakely.)

4*a*. Leaf in the intermediate stage; 4*b*, mature leaf; 4*c*, fruits. Little River, 16 miles from Burraga. (R. H. Cambage.)

5*a*. Buds, with well-defined rim at insertion of operculum; 5*b*, fruits, all very glaucous. Top of Canoblas, Orange. (R. H. Cambage.)

6*a*. Juvenile leaves; 6*b*, tapering multiflowered buds; 6*c*, cylindroid fruits in more than threes; 6*d*, fruits in threes. Guyra. (R. H. Cambage.)

7*a*. Leaves and buds (threes), flowering in the broad-leaved stage; 7*b*, buds; 7*c* and 7*d*, fruits; 7*e*, anthers, front and back; 7*f*, mature leaf. Kangiara, near Bowning. (R. H. Cambage.)

PLATE 111.

E. rubida Deane and Maiden—*continued.*

1. Long mature leaf of Nos. 6*a*–6*c* of Plate 110.

2*a*. Buds (multiflowered); 2*b*, fruits. Mt. Lindsay Station, 3,200 feet, Nandewars. (R. H. Cambage.)

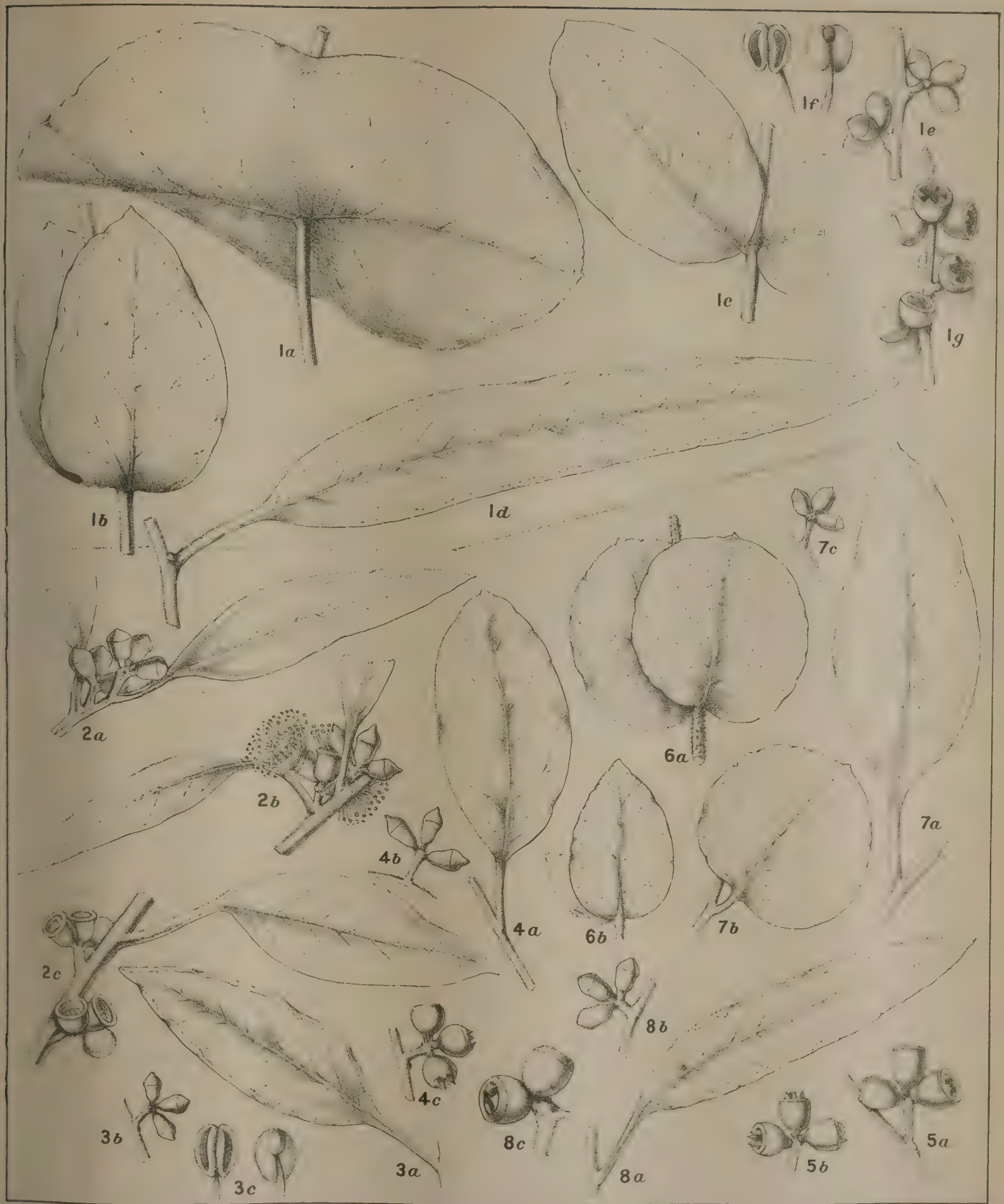
3*a*. Juvenile leaves; 3*b*, mature leaf; 3*c*, buds; 3*d*, fruits; 3*e*, front and back of anthers. Nundle. (M. P. Simpson.)

4*a*. Nearly sessile, nearly circular juvenile leaf; 4*b*, pedunculate, lanceolate juvenile leaf; 4*c*, mature leaf; 4*d*, fruits. 17 miles east of Walcha. (J.H.M.)

5*a*. Ovoid buds; 5*b*, immature fruits. Ben Lomond. (J.H.M.)

6*a*. Large mature leaf and pointed buds; 6*b*, fruits. Stanthorpe Road, Wilson's Downfall. (R. H. Cambage, No. 2834.)

7*a*. Large juvenile leaf; 7*b*, buds; 7*c*, domed unripe fruit. Wallangarra (Queensland border). (J. L. Boorman.)



EUCALYPTUS PERRINIANA, F.v.M. (*1*).

EUCALYPTUS GUNNII, HOOK., *f* (*2–8*). [See also Plate 109.]

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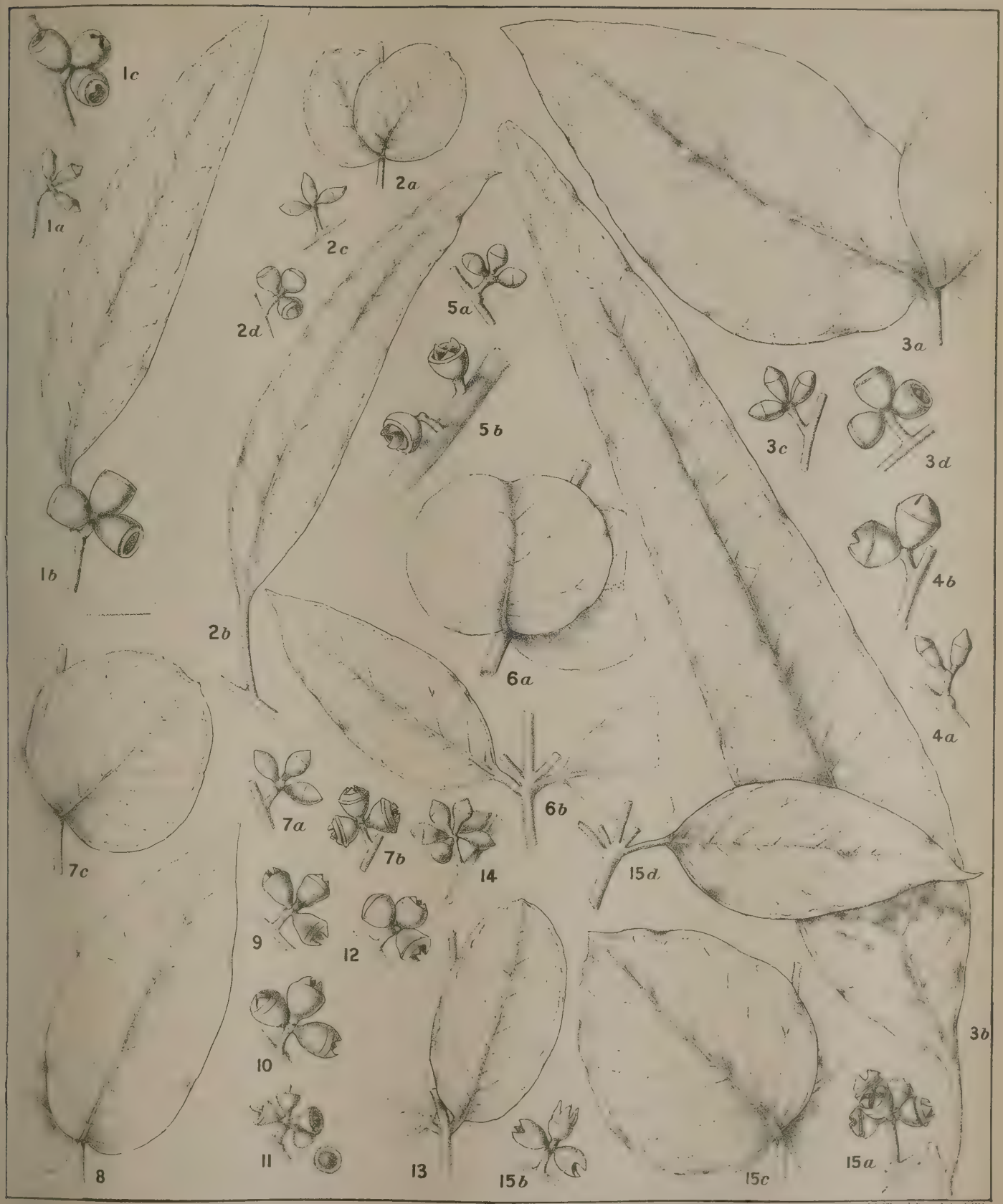

EUCALYPTUS GUNNII, HOOK., *f* (*1.*) [See also Plate 108.]

EUCALYPTUS RUBIDA, DEANE AND MAIDEN (*2–15*) [See also Plates 110 and 111.]

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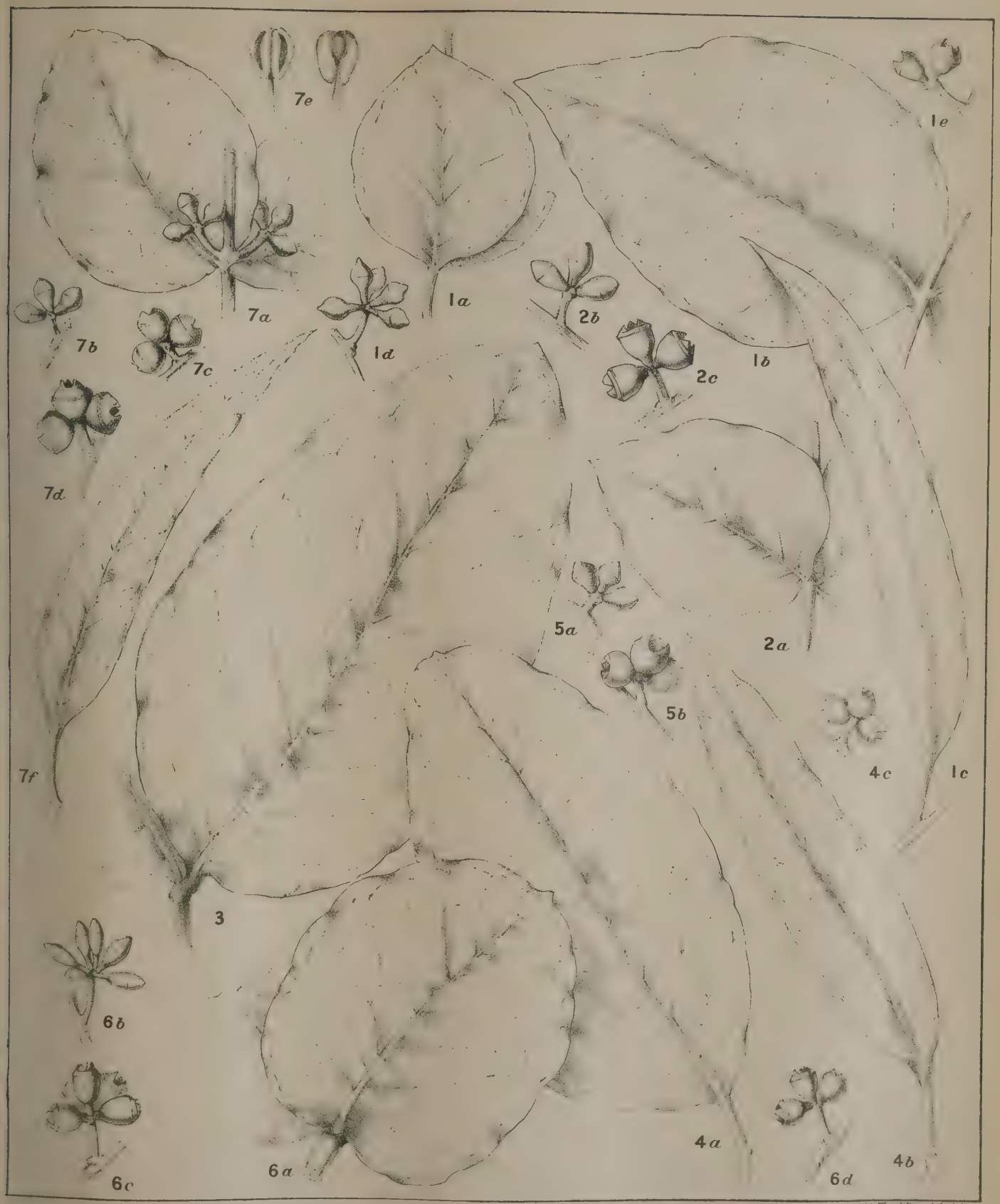

EUCALYPTUS RUBIDA, DEANE AND MAIDEN. [See also Plates 109 and 111.]

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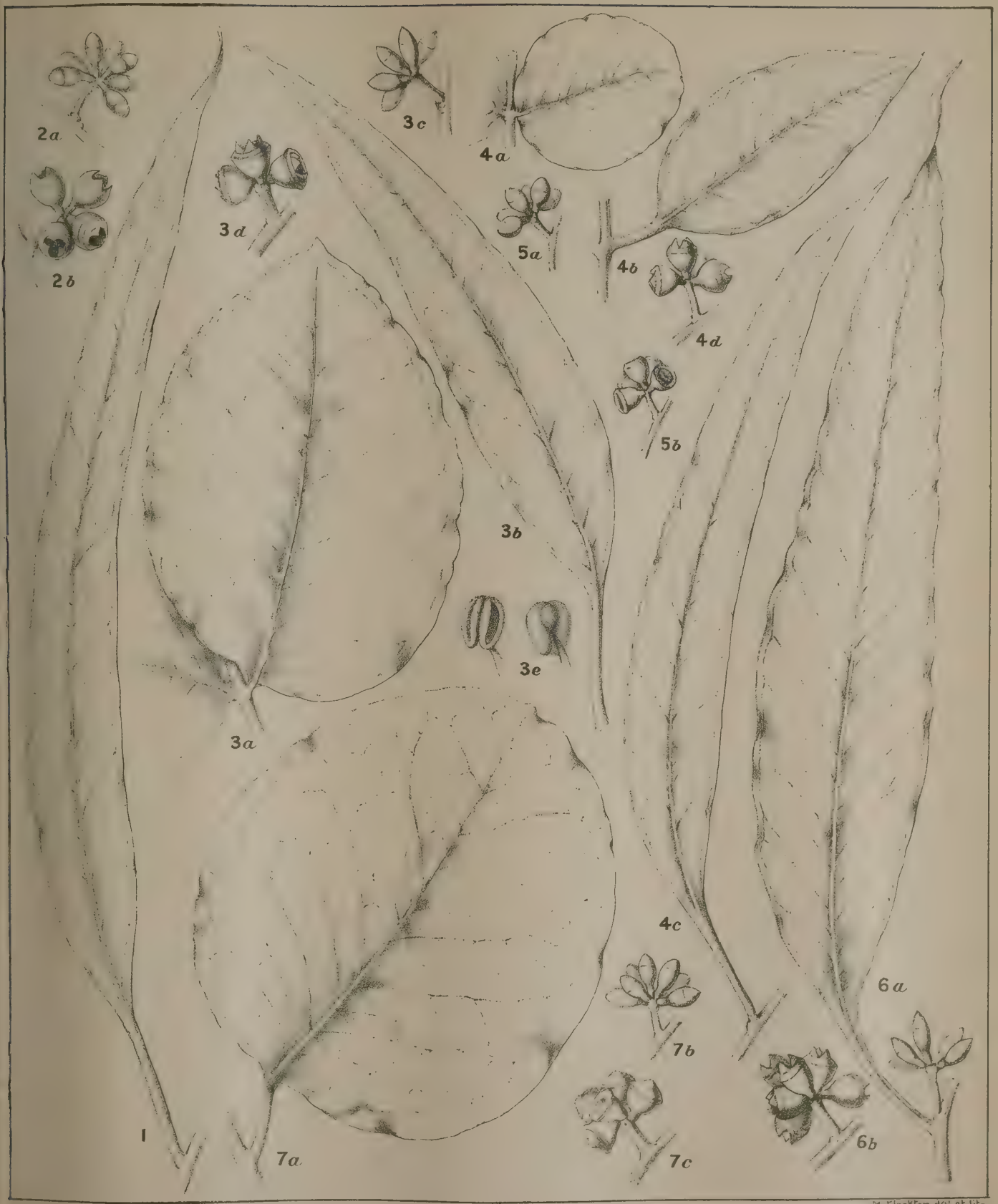
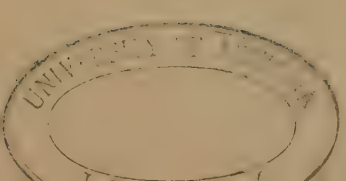


EUCALYPTUS RUBIDA, DEANE AND MAIDEN. [See also Plates 109 and 110.]



The following species of Eucalyptus are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets :—

acacioides A. Cunn (xlviii).
acmenioides Schauer (xxxii).
affinis Deane and Maiden (lvi).
amygdalina Labill. (xvi).
Andrewsi Maiden (xxi).
Baileyana F.v.M. (xxxv).
Baueriana Schauer (lvii).
Baueriana Schauer, var. *conica* Maiden (lviii).
Behriana F.v.M. (xlvi).
bicolor A. Cunn. (xliv).
Boormani Deane and Maiden (xlv).
Bosistoana F.v.M. (xliii).
Caleyi Maiden (lv).
capitellata Sm. (xxviii).
Consideniana Maiden (xxxvi).
coriacea A. Cunn. (xv).
corymbosa Sm. (xii).
crebra F.v.M. (liii).
dives Schauer (xix).
fruticetorum F.v.M. (xlii).
gigantea Hook. f. (li).
goniocalyx F.v.M. (v).
hæmastoma Sm. (xxxvii).
hemiphloia F.v.M. (vi).
longifolia Link and Otto (ii).
Luehmanniana F.v.M. (xxvi).
macrorrhyncha F.v.M. (xxvii).
maculata Hook. (vii).
melanophloia F.v.M. (liv).
melliodora A. Cunn. (ix).
microcorys F.v.M. (xxxviii).
microtheca F.v.M. (lii).
numerosa Maiden (xvii).
obliqua L'Hérit (xxii).
ochrophloia F.v.M. (l).
odorata Behr and Schlechtendal (xli).
paniculata Sm. (viii).
pilularis Sm. (xxxi).
piperita Sm. (xxxiii).
Planchoniana F.v.M. (xxiv).
populifolia Hook. (xlvii).
punctata DC. (x).
regnans F.v.M. (xviii).
resinifera Sm. (iii).
saligna Sm. (iv).
siderophloia Benth. (xxxix).
sideroxylon A. Cunn. (xiii).
Sieberiana F.v.M. (xxxiv).
stellulata Sieb. (xiv).
tereticornis Sm. (xi).
virgata Sieb. (xxv).
vitrea R. T. Baker (xxiii).

* Government Printer, Sydney. 4to. Price 1s per part (10s. per 12 parts); each part containing 4 plates and other illustrations.

Sydney : William Applegate Gullick, Government Printer.—1916.

A Critical Revision of the genus Eucalyptus

BY

J. H. MAIDEN, F.R.S., F.L.S.

(Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney).

Vol. III. Part 7.

Part XXVII of the Complete Work.

(WITH FOUR PLATES.)

"Ages are spent in collecting materials, ages more in separating and combining them. Even when a system has been formed, there is still something to add, to alter, or to reject. Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages. In these pursuits, therefore, the first speculators lie under great disadvantages, and, even when they fail, are entitled to praise."

MACAULAY'S "ESSAY ON MILTON."

PRICE TWO SHILLINGS AND SIXPENCE.

Published by Authority of
THE GOVERNMENT OF THE STATE OF NEW SOUTH WALES.

Sydney:

WILLIAM APPLEGATE GULLICK, GOVERNMENT PRINTER, PHILLIP-STREET.

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CXLI. Eucalyptus maculosa R. T. Baker.

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Eucalyptus ovata var. *camphora* var. nov.

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CXLIV. Eucalyptus neglecta Maiden.

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DESCRIPTION.

CXLI. E. maculosa R. T. Baker.

Proc. Linn. Soc. N.S.W. xxiv, 598 (1899), with Plate xliv.

FOLLOWING is the original description :—

A tree rarely exceeding 60 feet in height, usually from 20-40 feet (W.B.). Bark smooth to the ground.

Young leaves lanceolate, 2 or 3 inches long, opposite, very narrow.

Mature leaves narrow, lanceolate, falcate, not shining, same colour on both sides, venation obscure, intramarginal vein close to the edge, lateral veins oblique. Some trees have the leaves quite rigid and erect.

Peduncles axillary, slender, under 6 lines long, bearing from 4–16, occasionally 20, sessile or shortly pedicellate flowers. Calyx turbinate, about 1 line long; operculum of equal length, obtuse. Stamens all fertile, short and incurved, the free end appearing pendulous in the bud, as shown in the plate.

Anthers small, ovoid, opening by longitudinal slits, connective prominent.

Ovary flat-topped.

Fruit in the early stage much resembles that of *E. hæmastoma*, var. *micrantha*, and probably this species has been placed in the past under that variety. In the mature stage the fruit is turbinate, and resembles some forms of *E. Smithii* R.T.B., about 2 lines in diameter, rim domed, valves exserted, obtuse.

Hab.—Bungendore (W. Bäuerlen); Charley's Forest, Braidwood (W. Bäuerlen).

It grows in poor open forest ground up to 50 to 60 feet in height, and from 1 to 3 feet in diameter, with a rather dense head. Some trees on the ridges have the appearance in the distance of Pines, hence it is sometimes called "Pine." In a shrubby form it flowers when only 4 or 5 feet high. The bark is of different shades of grey, or bluish or yellow, with spots of about the same size and shape as those of *E. maculata* Hook., the true "Spotted Gum." The bark is smooth to the ground (W. Bäuerlen).

The following additional notes will be found useful :—

The juvenile leaves are stated to be very narrow lanceolate, but this is by no means always the case. If one turns to figures 7a and 7b, and also 8a and 8b of Plate 112 we have instances of considerable variation.

The juvenile leaf may be oblong, ovoid, broadly-lanceolate, and always petiolate.

The size of the mature leaf varies, though it is frequently narrow-lanceolate; sometimes it is undulate.

Often we note a short and thick pedicel in this species, but in many cases, *e.g.*, Victorian specimens, the contrary obtains.

The bud is tapering, but there are various stages from this to a hemispherical operculum.

There is not much variation in the shape of the fruit; there is a little in regard to size.

The term "Spotted Gum" appears characteristic enough in many places, but it is called "White Gum," "Bastard White Gum," "Cabbage Gum," and even other names.

SYNONYMS.

1. *E. lactéa* R. T. Baker, *Proc. Linn. Soc. N.S.W.* xxv, 691 (1900).
2. *E. Gunnii* Hook. f., var. *maculosa* Maiden *ib.* xxvi, 581 (1901).
3. *E. viminalis* Labill., var. (c) A. W. Howitt.

1. *E. lactea* R.T.B., *Proc. Linn. Soc. N.S.W.* xxv, 691 (1900).

A fair-sized tree with a dirty, flaky bark, which occasionally is smooth.

Sucker leaves ovate; leaves of mature trees lanceolate, up to 6 inches long and varying in breadth up to 9 lines, straight or falcate, not shining, of the same shade of green on both sides; petiole under 1 inch. Venation fairly well marked, veins oblique, spreading, the distinct intramarginal vein removed from the edge. Oil dots numerous.

Peduncles axillary, with few flowers (5 to 7) in the head, occasionally only 3. Calyx hemispherical. Operculum hemispherical, shortly acuminate. Ovary flat-topped. Stamens all fertile; anthers parallel, opening by longitudinal slits.

Fruits hemispherical to oblong; rim with valves domed and almost touching, thus leaving only a slight aperture to the ovary; or the rim thin and the valves exserted and widely distended.

Under *E. maculosa* two other trees are known by the same vernacular, viz. :—

(1) "Spotted Gum" at Charley's Forest and Fagan's Creek, Braidwood (W. Bäuerlen).

(2) "Spotted Gum" at Ilford (R. T. Baker). "The chemical and botanical evidence points, as far as yet examined, to these being distinct from the "Spotted Gum" of Bungendore, but in the meantime they are placed here tentatively as var. A and var. B of this species.

Var. A is, at certain seasons, the host of a Psyllid, producing a beautifully-figured, yellow-coloured lerp.

Var. B, when wounded, exudes a whitish substance, called by the settlers "buttermilk." (G. Harris) (R. T. Baker, *op. cit.*, p. 600).

Comparing these statements with the description of *E. lactea* R. T. Baker, it is evident that No. 2 is *E. lactea*, and also var. B. Var. A is typical *maculosa*, and it seems therefore to invite confusion to call it a variety. Mr. Baker did not begin this inconvenient practice.

In the description of *E. lactea* it is stated that the specific name is owing to the milky juice which exudes at certain periods of the year.

As regards the Charley's Forest, Braidwood, locality, this is quoted for typical *maculosa* (xxiv, 599) for No. 1 Spotted Gum (xxiv, 600), and for *E. lactea* (xxv, 692). This shows the undesirability of quoting more than one locality for a type.

I have not seen milky juice in any Eucalypt (except that which is similar to coco-nut milk is meant), and perhaps Mr. Harris simply meant a sweetish sap, such as is common in *E. Gunnii*, a species undoubtedly allied to the present one. We want further information concerning this "milky juice."

I am indebted to Mr. Baker for various specimens illustrating *E. maculosa* and *E. lactea*, and so far have been unable to separate them. Mr. Baker, however, says, "It resembles *E. maculosa* Baker in the shape of the fruits, but differs from it in the timber, bark, and oil constituents." These should, however, be very definitely stated, in order that they may be inquired into.

3. *E. viminalis* Labill., var. (c).

A somewhat peculiar form of *E. viminalis* grows between Toongabbie and Walhalla, Victoria, from about 1,000 feet to 2,500 feet above sea level. It does not exceed 100 feet in height. The bark is somewhat rugged, and persists over the bole, but on the branches is smooth and of a reddish brown tint, the foliage is plentiful, and of a somewhat ashy-grey tint. The leaves are lanceolar to falcate, the veins rather indistinct, but agree with those of *E. viminalis*. The umbels, buds, blossoms, and fruit are also of this type, but with this difference, that the umbels have numerous buds, and only rarely three arranged in cruciform manner.

The timber of this tree is of no use except as fuel. I have not observed it growing in any other locality. (A. W. Howitt, in *Trans. Roy. Soc. Vict.* ii. 100, 1890.)

RANGE.

E. maculosa is found in many parts of New South Wales and Victoria, particularly in cold, mountainous districts, usually on hillsides, and less frequently by the side of streams. In its typical form it occurs on dry slopes and ridges; in moist situations it takes on a good deal of variation.

Victoria.—A "White Gum," in a flat, most of which has water lying on it in the winter. It is a slender tree of 50 feet, with short ribbony flakes. I saw a tree 2 feet 9 inches in diameter. It has rather long and slender pedicels. Mississippi Creek, not far from the Cunninghame-Bruthen telegraph line (J.H.M.).

I wrote as above in front of the tree in July, 1908. Following is what Mr. H. Hopkins, with a wider experience of it, wrote to me later (June, 1913).

A White Gum. Trees small, usually 6 inches to 12 inches diameter at base, 30–50 feet high, very rarely up to 18 inches diameter and 60–80 feet high. Stems clean, with very white bark, not thick, very smooth and often with a whitish "bloom" upon it (pulverulent). Old bark peels off completely in thin brown flakes, right to the ground, leaving the trunk frequently somewhat of a mottled appearance, with bluish grey patches. Branches thin and straggling, producing a thin, light head. Leaves thin, dull green on both sides. Twigs are generally pale yellowish or sometimes pink. Foliage rather thin and scattered.

Found scattered amongst the Stringybark (*E. eugenioides*) and Mountain Ash (*E. Sieberiana*) forest at Mississippi Creek, about 10 miles North east of Bruthen (East Gippsland); also at Cobbannah Creek, Dargo Road.

"Buds very commonly seven or less. *E. viminalis*, Walhalla Road" (A. W. Howitt). Probably his *viminalis* (c) of *Trans. Roy. Soc. Vict.* ii., 100 as already quoted.

Turnback Creek, O'Rourke's (A. W. Howitt); Beechworth (Falck); Ararat (A. W. Howitt).

Mr. R. H. Cambage has recorded it from Ballarat, and Mr. P. R. H. St. John at Macedon and Woodend (R. T. Baker, in *Proc. Aust. Ass. Adv. Sci.* xiv, 1913).

New South Wales.

Southern Districts.—"Spotted Gum," Charley's Forest, Braidwood (W. Baeuerlen). One of the specimens quoted in the original description; Bungendore (W. Baeuerlen), "Spotted Gum" type of Mr. Baker's *maculosa*, var. A. (I have already shown that it must be typical of the species.) Has round, shiny buds. Gundaroo and Yass (Rev. J. W. Dwyer), Burrinjuck (J. L. Boorman). With very small dainty fruits, the smallest I have seen in this species. Federal Capital site, Queanbeyan (R. H. Cambage, No. 2938). "Spotted Gum" or "Leopard Gum." This tree is one of a group called "Spotted Gum." My informant calls it "Leopard Spotted Gum." The bark is smooth, and the small irregular reddish patches give it the name. Timber bad. Dull foliage like the Strathdownie specimen. On dry hilly ground; Queanbeyan (H. Deane). Umeralla River, S.E. of Cooma (R. H. Cambage, No. 1873). A White Gum, Strathdownie, Rosewood, in the Murray Range, 50 miles from Wagga, on the way to Tumberumba (D. McEachern) has long leaves.

A White Gum from Marulan (J.H.M.), with plum-coloured bark with blotches. Multiflowered, with *ovata*-like (see below p. 134) buds. Fruits small.

Some, not all, of the fruits attenuated at the base like *E. ovata*, Wingello (J. L. Boorman). Specimens from the same locality with the conoid young fruits and also the buds of *E. ovata* (J.H.M. and J. L. Boorman). These trees were originally noted in the field as *punctata*-like—that is to say, with smooth bark, raspy-rough in patches, like ordinary Grey Gum (*E. punctata*).

The following notes on two trees in the Goulburn district were made by me in the field in August. Although differing slightly between themselves, they belong to this species: (*a*) Fruits conoid when young, very much domed when old; in 3's up to 7's, pedicels thick; wood reddish; young twigs angular. (*b*) Flowers profusely; rarely in 3's, in 4's, 5's, and 6's, rarely more than 6's; usually in 5's, capitate. Leaves usually narrow; venation very prominent. Wood reddish. Yellow tips of young foliage. Stalks round or nearly so; young twigs angular. Fruits small.

Western Districts.—Frederica Falls, Lawson (R. T. Baker). Fruits nearly hemispherical, and some of the sucker-leaves rather narrow. The juvenile leaves are undoubtedly *maculosa*, but the fruits are the fruits of *ovata*. *E. maculosa* is first observed on the Great Western Road as one enters Katoomba travelling from Sydney. Thenceforward it is a very common tree (R. H. Cambage and J.H.M.).

Blackheath and Mount Victoria (J.H.M.). "Cabbage or White Gum," Mount Wilson (Jesse Gregson and J.H.M.). Bark reddish or brownish. I cannot distinguish these from the Marulan specimens referred to above.

E. maculosa and *E. ovata* seem to be in a state of flux in the higher parts of the Blue Mountains.

Juvenile foliage normal to broad, though not as broad as *E. rubida*. Buds round as well as umbonate and tapering-pointed; Wallerawang (J.H.M.).

Rydal (J.H.M.) " Cabbage Gum " and " White Gum," Sunny Corner to Tarana (A. Murphy); multi-flowered; small fruits precisely matching the Marulan specimens. One of the forms showing the impossibility of separating *maculosa* from *ovata*, " Cabbage Gum," Portland and Sunny Corner (J. L. Boorman); " Brittle Gum," " White Gum," Capertee (J. L. Boorman and J.H.M.); " Silver Leaf White Gum," Capertee (A. Murphy); " Spotted Gum," glaucous, Ilford (R. T. Baker). A co-type of his *E. lactea*.

" Spotted Gum," *E. maculosa* var. B. of Mr. Baker, Oberon-road, O'Connell (R. T. Baker and R. H. Cambage).

Also at Mount Vincent, Ilford (R. T. Baker). (These are also Mr. Baker's *E. lactea* localities.)

" Spotted Gum," *E. lactea* R. T. Baker. Oberon (R. T. Baker). In addition to the above, Mr. Baker also quoted Southern-road, Wingello, and Main Western-road, Blackheath and Mount Victoria for *E. lactea*. Bathurst and Burraga (R. H. Cambage); " Cabbage Gum," Bathurst (A. Murphy and others); Bathurst to Sofala (R. H. Cambage and J.H.M.); " White Gum," dark bark at butt, fruits up to seven in umbel, opercula longer than usual. Rosedale, Orange (R. H. Cambage); " White Brittle Gum," Ophir, Orange (R. H. Cambage).

AFFINITIES.

1. With *E. praecox* Maiden. See *E. praecox* below.

2. With *E. rubida* Deane and Maiden.

The bark is patchy, like *E. tereticornis*, and also ribbony or ribbony-scaly right up to the first fork. Rough ribbony, like *E. viminalis*, *E. Gunnii* and *E. rubida* often are.

In dry situations it is often difficult to discriminate between it and *E. rubida*. I have, on several occasions, had to obtain branches of tall trees in order to discover which form they were.

3. With *E. ovata* Labill.

I sometimes cannot separate *E. maculosa* and *E. ovata*, intimately as I think I know them. Nearly every character seems to have transit forms, but the juvenile foliage (narrow in *E. maculosa* and broadish in *E. ovata*) is usually the best guide. The awkward part is that they are not always available. In the case of many Blue Mountains specimens in particular, if only buds or fruits, or both are available, I find myself, at different times, placing the same specimen first under one species and then under the other.

The same remarks apply to specimens in my possession from Wingello in the Goulburn district.

4. With *E. haemastoma* Sm., var. *micrantha* Benth.

By the non-botanist the Spotted Gum form (*i.e.*, that growing in dry situations) is usually confused with the common White Gum (*E. haemastoma*), but it belongs to the Parallantheræ. Mr. R. H. Cambage has obligingly written the following comparison of the two trees, as he knows them, from Mount Victoria to Burraga, Ophir, Orange, &c. He calls it "White Brittle Gum," and *E. haemastoma*, var. *micrantha*, "Red Brittle Gum."

This tree has various names in different localities. At Wiseman's Creek, near Bathurst, it is called "White Cabbage Gum," while at Ophir, near Orange, some miners give it the name of "Spotted Gum," as it loses its bark in small patches, which have a yellowish tint, but are not so distinctive as *E. maculosa*. "White Brittle Gum" is a very general name.

By a casual observer this tree would be confused with *E. haemastoma*, and in general appearance it very much resembles it. When seen growing together it will be noticed that the white Brittle Gum is *whiter* in the bark than *E. haemastoma*, the former often being covered with a white powder; hence another name for it is "White Floury Gum," which I have heard used.

The fruits of White Brittle Gum are more sessile and domed. The leaves are not so brittle as those of *E. haemastoma*, and the difference can be detected by biting them. I have seen this experimented on by mixing the leaves of both trees and then having them correctly separated in this way as a test.

In the Orange and Bathurst districts both trees flourish on hills of Silurian slate, but, generally speaking *E. haemastoma* takes the higher land of the two.

Working miners use both trees for timbering shafts, but for fuel *E. haemastoma* is preferred, as it burns well when only half dried.

If there is any doubt as to whether a tree is White Brittle Gum, as *E. haemastoma* is sometimes called in localities where both trees grow, an axeman who has worked much among them can settle the point by a few blows with the axe, *E. haemastoma* being the more brittle of the two.

Around Ophir and Orange the White Brittle Gum seems to flower later than *E. haemastoma*.

Mr. Baker's statement of the comparison is :—

"It differs . . . in the shape of mature fruits, venation of leaves, in all the stamens being fertile, in the anthers being parallel, and especially in the chemical constituents of the oil. The bark of this species is always more bluish and less glossy than *E. haemastoma* Sm." (R. T. Baker *op cit.* p. 599).

See also Mr. W. Baeuerlen's remarks *op. cit.* p. 601.

5. With *E. Smithii* R. T. Baker.

"It has affinity with *E. Smithii* in the fruits in some instances, and particularly in the chemical composition of its oil" (R. T. Baker).

DESCRIPTION.

CXLII. E. præcox Maiden.

In *Proc. Roy. Soc. N.S.W.* xlviii, 423 (1914).

Arbor pumila, ramis dependentibus. Cortex lævis, maculata, secedens. Lignum pallidum et fragile. Folia juvena lato-ovata et crassa. Folia matura petiolata, lanceolata ad lato-lanceolata ad fere ovata, dilute virentia. Alabastra in umbellis glaucis, ovoidea in juventute. Operculum conicum et acuminatum, calycis tubo leniter breviore. Florit in ætate lato-foliata vel juvenile. Fructus fere hemisphærici, circiter ·6 cm. diametro, margine lato et rotundato valvarum spicibus distincte exsertis.

A dwarf tree of drooping habit. Bark smooth, blotched and also ribbony.

Timber pale-coloured and brittle, showing a tinge of reddish-brown, and possessing kino veins.

Juvenile leaves broadly ovate, thick, coarse, venation very prominent, lateral veins at about an angle of 45 degrees to the midrib, intramarginal vein far removed from the edge.

Mature leaves petiolate, from lanceolate to broadly lanceolate and nearly ovate, pale green, and the same colour on both sides, midrib prominent, lateral veins distinct but not prominent, intramarginal vein well removed from the edge.

Buds in glaucous umbels, ovoid when young, when riper operculum conical and pointed, a little shorter than the calyx-tube, which tapers gradually into a short, thickish pedicel, the whole on a peduncle of about ·7 cm.

Flowers not seen fully expanded. Unripe anthers appear to be similar to those of *E. maculosa* of the same age.

Fruits nearly hemispherical, about ·6 cm. in diameter, rather abruptly set on the short pedicels, rim broadish and domed, the tips of the valves distinctly exsert.

Type from Capertee, N.S.W., J. H. Maiden and J. L. Boorman, March, 1901.

This species, which does not appear to be a strong one, possesses characters in common with *E. maculosa* R. T. Baker and *E. rubida* Deane and Maiden.

It has a closer and general resemblance to *E. maculosa*, but the fruits are rounded and the juvenile foliage is broad. That of *E. maculosa* is on the whole narrow, although exceptionally it may be broadish.

An outstanding character of the present species is that of the flowering, which may take place while the leaves are in the broad or juvenile stage, and the specific name is given in reference to this.

As regards New South Wales, the only truly homoblastic species, so far as we know, is the disappearing endemic *E. pulvigera*, A. Cunn. There are, however, several species in which the vegetative form, or the foliage characteristic of juvenility, persists for a considerable time, the tree flowering frequently, and indeed usually, in this stage.

Indeed, the advent of the mature foliage is often so retarded that it may require careful search to find it, and from some individuals it may be absent altogether. We must, of course, bear in mind that the adult foliage may be found at the very top of a particular tree, and if the tree be of any size, it is quite easy to omit seeing it.

New South Wales species in which the juvenile foliage is very persistent include *E. parvifolia* Cambage and *E. cinerea* F.v.M., *E. melanophloia* F.v.M., and the one proposed as new in this paper is an addition to a short list.

I have referred to the subject in another paper* and have quoted a number of species which, so far as we know, are homoblastic (isoblastic) throughout life.

The ascertainment, during the last few years, that certain reputed homoblastic species are really heteroblastic, stimulates us to further inquiry in the same direction. Incidentally, it may be remarked that Dr. Diels has proposed the word "helicomorphy" to include the two leaf forms in heteroblastic species.

* "On two new Western Australian species of Eucalyptus," *Journ. Nat. Hist. and Science Soc., W.A.*, vol. iii., No. 1.

DESCRIPTION.

CXLIII. E. ovata Labill.

Nov. Holl. Pl. ii with t. 153 (1806).

FOLLOWING is a translation of the original :—

Operculum hemispherical and mucronulate; umbels lateral and terminal; peduncles and branchlets somewhat round; fruit hemispherical.

A shrub a fathom and a half high and more, with alternate, ovate, coriaceous, quite entire or notched leaves, the uppermost ones especially, somewhat acuminate. Flowers umbellate on short pedicels on a somewhat round common peduncle slightly shorter, the petiole half-round. The style shorter than the stamens, the stigma somewhat capitate. Capsule hemispherical, rather sunk, 4-celled. Habitat in Van-Leuwin.

It differs from *E. haemastoma* especially in the leaves and peduncles of the umbels, and from *E. piperita*, which in other respects is the nearest tree in the position of the umbels and in the peduncles of the same.

A shrub was the type; it attains the height of a medium-sized tree.

The comparisons with *E. haemastoma* and *E. piperita* mean little to-day; they were two of the very few species available for comparison in Labillardière's day.

In the plate (see Fig. 1a, Plate 113) the artist Redouté has exaggerated the crenulation of the leaf-margins. He has committed a similar fault in the figure of *E. cordata* Labill.

Labilladière says, "In terra Van Leuwin," a slip of the pen for "Van Diemen." Bentham, however, assuming that the locality is Cape Leeuwin, says (B.Fl. iii, 200) . . . . "from West Australia. Does not occur in the distributed sets of Labillardière's plants I have seen. From the figure it appears probable that the specimen represented was an adventitious branch, with much broader leaves than the ordinary flowering ones. It is very likely, therefore, a form of some one of the described western species, possibly *E. brachypoda*."

This error of locality is corrected in specimens collected by Labillardière, which are labelled "*E. ovata* Labill., Terre de Diemen, Muséum de Paris, 1821," which I have seen.

Then we have De Candolle's description :—

18. *E. ovata* (Labill., l.c.p. 13, t. 153) operculo hemisphaerico mucronulato cupula breviore, pedunculis axillaribus aut subterminalibus subteretibus petiolo brevioribus, floribus 3–5 capitatis, foliis ovatis mucronatis subcrenatis. In terrâ Van Leuwin. Folia coriacea, alia integerrima, alia irregulariter sub-crenata. *E. mucronata* Link *Enum. Hort. Berol.* 2, p. 30 ex specimene à cl. Otto miss. *E. androsemifolia* Hoffmann's *verz.* 1826. Folia petiolo semipollic., limbo 3–4 poll. longo 1–2 lato (v.s. sine fl.) (*DC. Prod.* iii, 218.).

The receipt of a drawing of the whole of a specimen from Kew, and my own travels and collections in Tasmania have caused me to revise my earlier views in regard to *E. ovata*. At one time (*Proc. Linn. Soc.* N.S.W. xxvi, 575, 1901) I leaned to the opinion that it was intermediate between *E. acervula* Hook. f., non Sieb., and *E. camphora* R. T. Baker, but I now hold the view that it cannot be separated from *E. acervula*, and a suite of specimens from Mr. L. Rodway, and his opinion, confirm this.

Let us take the characters in order :—

A tall tree with smooth bark more or less exhibiting ribbons. Timber pale.

Juvenile Leaves. It will be observed that the juvenile leaves figured by Mr. R. T. Baker as *E. paludosa* are broadly lanceolate—acuminate, in fact. These were drawn from a specimen " Barber's Creek (H. Rumsey)." Singularly enough, specimens of typical *E. rubida* from the same district display a special tendency to lanceolate juvenile leaves. I have specimens from Mount Wilson which have similar juvenile leaves, and which I look upon as a form intermediate between *E. maculosa* and *E. ovata*. There seems a tendency in what I have elsewhere termed species of the *Gunnii* group (*maculosa*, *ovata*, *rubida*) to have acuminate juvenile leaves, and when people collect juvenile leaves much more commonly than they do at present, it will be seen in what districts this tendency is most prevalent and to what extent.

Speaking generally, the juvenile leaves of *E. ovata* are broad, glabrous, ovate to circular; undulate; with or without a point, shortly petiolate.

Mature leaves. Undulate, sometimes emarginate, narrow to broad. Labillardière gives the shape of those of *E. ovata* as " ovate," and Hooker those of his *acervula* as " ovate to elliptic lanceolate."

There are all stages from lanceolate to very broad, so that it is impossible to make a line of demarcation between trees with narrow or broad leaves. Petioles long.

Buds. Opercula pointed to blunt, sometimes rostrate. Multiple in the umbel.

The rostrate bud with very sharp operculum ring is seen both in *ovata* and its variety *camphora*.

Fruits. Pedicellate to nearly sessile or perhaps sessile. Hemispherical or urceolate to conoid in shape. Rim sometimes very marked. Sometimes a double-raised ring. Valves sunk, or the tips may be flush with the orifice or well exserted.

SYNONYMS.

1. *E. androsemæfolia* Hoffmannsegg.
2. *E. mucronata* Link.
3. *E. persicifolia* Loddiges.
4. *E. persicifolia* Miquel.
5. *E. Stuartiana* prima F.v.M.
6. *E. Stuartiana* prima F.v.M. var. *longifolia* Benth.
7. *E. Baueriana* Miquel non Schauer.
8. *E. citrifolia* F.v.M.
9. *E. acervula* Hook. f., non Sieber.
10. *E. Gunnii* F.v.M. non Hook. f.
11. *E. paludosa* R. T. Baker.
12. *E. Gunnii* Hook. f., var. *elata Hook.* f.

1. *E. androsemæfolia*, Hoffmg., *Verz. Pfl. Nachtr.* ii, 113.

E. foliis ovatis ovatove-oblongis obtusiusculis subapiculatis glaucescentibus subtus glaucis, inferioribus oppositis subcordatis, superioribus petiolatis alternis. Hab. in Austral.

Folia, hucusque non obliqua, similia magnis quibusdam et latis Hypericorum, ita ut *E. hypericifoliam* putassem, nisi mensura, 2 '–2' 6" lg. ut summum 1' 6" lt. ab. eâ in Link. Enum. datâ, nimis differret. An forte *E. ovata* ? Lab. (Steud).

I have not seen this species. Bentham says it is very doubtful. De Candolle (*Prod.* iii, 218) says that it is a synonym of *E. ovata* Labill.

2. *E. mucronata* Link, *Enum. Hort. Berol.* ii, 30, is described as follows from leaf only :—

220. *E. mucronata.* Fol. pet. 6" longo, lamina lanceolata acumine brevem mucronem referente subundulata subtus nervis parallelis, utrinque nerva marginali, 3-4' longa 1–2' lata basi sub-ovata variæ magnitudinis. Hab. In Australia. Non floruit.

Bentham says this is very doubtful. De Candolle (*Prod.* iii, 218) gives it as a synonym of *E. ovata* Labill.

3. *E. persicifolia* Lodd., *Bot. Cab.* t. 501.

This plant is a native of New Holland, and was introduced several years since; it is a large evergreen branching shrub or small tree. The flowers are produced in axillary heads from six to twelve blossoms each, usually situated at some distance below the ends of the shoot; they are very long before they expand, which is generally the case in this genus, and have no scent. Our drawing was made in July last, from flowers which had been full twelve months coming to perfection.

It will be seen that, although often quoted, this plant has not been botanically described.

Var. B is Sieber's No. 593, see Don, ii, 818.

I have not seen Loddiges' plant, which Bentham refers to *E. viminalis* (of which, if correctly referred to that species, it must be a multiflowered form). The leaves are narrow-lanceolate.

The Index Kewensis states that *E. persicifolia* Lodd. is synonymous with *E. Stuartiana*. By that *E. ovata* is meant. It may be, but it is doubtful.

4. *E. persicifolia* Miq., non Lodd., referred to briefly in *Ned. Kruidk. Arch.* iv, 137 (1856) as follows :—

" 29. *Eucalyptus persicifolia* Lodd. DC. Prod., iii, p. 217, n. 8 (?) Van Dieman's-land (Stuart n. 12)."

I have not seen the plant referred to by Miquel, but Mueller (Eucalytographia) states that it is a form of *E. Gunnii*. In Index Kewensis it is referred to *E. Stuartiana* just like *E. persicifolia* Lodd. (supra).

Schlechtendal in *Linnaea*, Vol. 20, p. 659, has the following. I have not seen his specimen.

181. *Eucalyptus persicifolia*, Lodd., DC. Pr. iii, p. 217, n.8. Specimina nondum florentia differunt a Sieberianis : foliis brevioribus, umbellis longius pedunculatis floribusque longius pedicellatis.

Altera forma similis ramulis tenuioribus, foliis angustioribus nec brevioribus, pellucide punctatis et minus crasse coriaceis, floribus minoribus, calyptris obtusioribus longius distare videtur, sed ex paucis speciminibus in tanta formarum affinitate certum quid contendere non audeo.

5. *E. Stuartiana* F.v.M. prima.

Following is the original description :—

18. *Eucalyptus Stuartiana* Ferd. Müll. ramulis teretiusculis rubello-fuscis, foliis longe petiolatis longe subanguste lanceolatis acumine tenui vulgo sphacelato terminatis, basi aequali vel inaequali in petiolum semiteretem attenuatis, coriaceis, margine incrassatis, sparse punctatis, costa subtus praesertim distincta, venis subpatulis fere prorsus obtectis, pedunculis axillaribus tetragono-angulatis 4–8 floris quandoque in ramulo aphyllo confertis, floribus brevissime pedicellatis, calycis tubo turbinato pallide viridi operculum brevi-conicum acutum fuscum verniceum superante, antheris ellipticis.

Tasmania (Stuart).

Petioli ½–vulgo fere 1 poll. longi tenues. Folia 4–5 poll. longa, 4–7 lin. lata. Pedunculi fere semi-pollicares. Miq. in *Nederl. Kruidk Arch.* iv, 131 (1856.)

This is *E. Stuartiana* F.v.M. prima, and the situation is explained at p. 4, Part xxi of the present work.

The following specimens of *E. ovata* were actually labelled *E. Stuartiana* by Mueller himself, or those who followed him.

(*a*) 1903, R. Gunn., New Norfolk, V.D.L.

Following are specimens which were collected by Oldfield. They are labelled :—

(*b*) *E. Stuartiana*, " Red Gum," " Jericho, Tasmania."

(*c*) " Hill near Lake Tiberias, Tasmania "; the juvenile foliage of this specimen was labelled *E. viminalis*.

(*d*) O'Brien's Bridge, Tasmania.

(*e*) There is a specimen labelled in Oldfield's handwriting, " Red Gum, Tasmania, *E. acervula*," in herb. Calcutta.

There is a specimen of this plant in Herb. Paris to which Naudin has attached a note, "*E. acervula* Sieb. Réuni par Bentham à l'Eucalyptus Stuartiana—espèce doutant."

(*f*) "White Gum of Mount Macedon, F. Mueller, 1852."

(*g*) An identical specimen from "Barwon, 1853," has the label "*E. Stuartiana*, formerly labelled *E. Gunnii*," showing that Mueller labelled the plant *Gunnii*, then *Stuartiana* (and finally *Gunnii*).

(*h*) Bullarook Ranges, Ballarat.

(*j*) Curdie's Inlet, 1874 (f.—j. are Victorian).

(*k*) "*E. Stuartiana*, one of the White Gum trees. In moist localities, as well in plains as ranges. A tree of an enormous size in Victoria, perhaps only surpassed by the *Eucalyptus amygdalina* and the Karri Eucalypt of West Australia (*E. diversicolor* or *E. colossea*)." (Mueller in *Official Record, Intercol. Exhib. Melb.* 1866–7, p. 222).

One of the White Gum trees of the eastern parts of South Australia, Victoria, Tasmania, and the south of New South Wales; called, strange to say, the Apple-tree about Dandenong; (confusion with another *Stuartiana* F.v.M., J.H.M.) the Water Gum tree of Tasmania may belong to the same species; it is designated locally with still other names. The bark of this often very big tree, furnishes good material for packing paper, and, like others, for pasteboard (another example of confusion). (*ib.* p. 246).

(*l*) "*E. Stuartiana*, F.v.M., Marshall's Plains, Flinders' Island. A. Simson (573), June, 1877" (W. W. Spicer in Herb. Oxon.).

It is the "Red Gum, *E. acervula*," of Spicer's "Handbook of the Plants of Tasmania," p. 112.

(*m*) In the Tasmanian Court of the Melbourne Exhibition, 1888, were shown "Red Gum" sleepers ("*E. Stuartiana*") from Rhyndaston, belonging to the Tasmanian Government Railways.

In R. M. Johnston's "Tasmanian Official Record," 1891, p. 136, the following passage occurs :—

Red Gum, *E. Stuartiana* Muell. This tree is common near Southport, but more widely distributed in the south-eastern ranges of Australia. When well grown it attains a middle size, seldom reaching 100 feet in height. Stems oftener twisted than straight. The wood is stated to be hard, but does not split well: it is used for fence posts, and it is then very durable; sometimes used for rough kinds of furniture, as it takes polish well. It is known as "But-But" in Gippsland.

It is evident from this that the timber of *E. ovata* is more valued in Tasmania than on the mainland; the erroneous allusion to "But-But" will be understood on reference to *E. Stuartiana*, p. 67, 68, Part xxiv of the present work.

It is this *E. Stuartiana* for the most part which is the *E. Stuartiana* of B.Fl. iii, 243. The synonyms there given are :—

(*a*) *E. acervula* Hook. f., non Sieb., (*b*) *E. Gunnii* F.v.M., non Hook., (*c*) *E. persicifolia* Miq., non Lodd., (*d*) *E. Baueriana* Miq., non *Schauer*, (*e*) *E. falcifolia* Miq. (one specimen).

E. falcifolia Miq., in this connection, requires a little explanation, and it is given at pp. 61, 62, Part ii of the present work. Some of the specimens distributed as *E. falcifolia* are *E. Gunnii* var. *acervula* (*E. ovata*), and so is "one specimen" examined by Bentham, but the specimen figured by me at Fig. 4, Plate 8 is *E. obliqua* L'Herit. In other words, the material distributed as *E. falcifolia* was mixed.

6. *E. Stuartiana* F.v.M. prima, var. *longifolia* Benth. We now turn to *E. Stuartiana* F.v.M. var. *longifolia* Benth. (B.Fl. iii, 244).

Bentham defines it as :—

Leaves very long (4 to 8 inches) and acuminate, more or less falcate, but thick, with the veins scarcely conspicuous, the intramarginal one often near the edge. Umbels several flowered. Operculum short.

New South Wales. "Yellow or Grey Gum and Bastard Box," *Woolls* (?) in Herb. F. Mueller; Twofold Bay, "Turpentine Gum" or "Hiccory," *Oldfield, F. Mueller.* In foliage and inflorescence this resembles in some measure *E. virgata*, but the buds, anthers, and fruit are quite different.

A specimen received from the Melbourne Herbarium many years ago throws some light on the matter. It is *E. ovata*, and is labelled "Hickory (very tough). One of the largest trees of these parts. Twofold Bay (Lockhart Morton)." Morton was a friend of Oldfield. It is in bud, opening flower and early fruit, and was labelled by Bentham and Mueller at different times *viminalis, saligna, Gunnii, and Stuartiana.* It has rather long leaves, certainly longer than average specimens, and this led Bentham to call it variety *longifolia.*

The following specimen is also interesting :—

Eucalyptus acervula Sieber, Pl. Exsicc. N. Holl. no. 469, DC. Prodr. 3, p. 217, Hab. New South Wales; probably in the vicinity of Sydney, Wilkes' U.S. Expl. Exped. 1838–42 (Botany, Asa Gray, i, 553), No. 25,533 of U.S. Nat. Herb.

In flower and early fruit. No opercula. It is *E. punctata,* DC. probably.

If we turn to Mueller's "Eucalyptographia" under *E. punctata,* we find that the author states that *E. Stuartiana* var. *longifolia* is "partly" *E. punctata.*

The explanation of the whole confusion appears to be this :—

The *E. Stuartiana* referred to is *E. acervula* Hook. f., non Sieb. = *E. ovata* Labill. Bentham had before him specimens of this species which had longer leaves than usual (the specimen of Lockhart Morton has undoubtedly longer leaves), but subsequent knowledge shows us that these specimens are in no way abnormal, and that the var. *longifolia* should be dropped. Mueller's identification of this "*Stuartiana* var. *longifolia*" with *E. punctata* DC. is a mistake easy to make, particularly as it was only in very recent years that Mueller himself knew what *E. punctata* DC. was. Bentham never did know. Asa Gray probably made his mistake through following Mueller in some way.

7. *E. Baueriana* Miq. non Schauer, referred to in *Ned. Kruidk. Arch.* iv (1856), 137, as follows :—

"30. *Eucalyptus Baueriana* Schauer (?) Walp. Rep. ii, p. 925. *E. citrifolia* F. v. Müll. Herb. *Tasmania borealis* (Stuart).

I have seen a specimen (cf. *E. citrifolia*, F.v.M. Herb.) in Herb. Barbey-Boissier, which is *E. ovata.* In the Index Kewensis *E. Baueriana* Miq. is referred to *E. Stuartiana*, which is the "Red Gum" of Tasmania, and identical with *E. Gunnii* var. *acervula.*

I have a memorandum of having seen when at Kew a specimen labelled "*E. Baueriana* Miq.," and of having referred it to "the lowland form of *E. Gunnii*," which is another name for *E. ovata*.

For *E. Baueriana* Schauer, see Part xiii of the present work.

8. *E. citrifolia* F.v.M., Herb. See *E. Baueriana, supra*. I have seen "Plantæ Müllerianæ, *Eucalyptus citrifolia*, F. Müller, Nov. Holland méridional" (one of Miquel's labels). In Herb. Barbey-Boissier.

It is in flower and early fruit only, with rather broad shiny Citrus-like leaves, hence the specific name. It is *E. ovata* and is identical with *E. Baueriana* Miq., non Schauer.

9. *E. acervula* Hook. f. non Sieb.

Description.—Arbor elata, ramulis robustis pendulis, foliis ovata-v. elliptico-lanceolatis acuminatis coriaceis subnitidis rectis falcatisve nervis divergentibus, pedunculis elongatis petiolis brevioribus 4–8-floris, calycibus obconicis crasse pedicellatis, operculo conico calyce æquilongo, capsulis obconicis ore plano dilatato latiusculo, valvis immersis—De Cand. Prodr. iii, 217. (Gunn. 1297, 1081, 1088, 1093.)

Hab.—Abundant in many parts of the Colony, as on the Derwent from Hobarton to Bothwell, Launceston, &c.—(Fl. Oct.).

Distrib.—South-eastern Australia.

This appears to be a very constant species, all my specimens, which are very numerous, and many individuals being very similar; it is most nearly allied to *E. viminalis* in the flowers, but differs in the sunk valves of the capsule, and leaves; the foliage is that of *E. Gunnii*, but the peduncles are always more than three-flowered, and the capsule is different. Trunk erect, often lofty; bark smooth or rough, pale or brown. Branches more or less pendulous. Leaves 2–4 inches long, ovate–lanceolate or elliptical-lanceolate. Peduncles stout. Flowers four to eight. The bruised foliage has a much sweeter odour than is usual in the genus—in Hobarton specimens, at any rate. (*Fl. Tas.* i, 135).

It will be observed that the shape of the leaves is ovate to elliptic-lanceolate.

We have also *E. acervula* Miq., non Sieb., *Ned. Kruidk. Arch.* iv (1856), 137.

I have examined *E. acervula* Miq., leg. R. Brown, from Herb. Brit. Mus., Kew, Berol., and other herbaria. The same, R. Brown, 1802–5, from the Derwent, Tasmania, distributed from Herb. Brit. Mus., 1876. This specimen, in some collections, bears the label "*E. viminalis* (?)." I have not seen any number attached to it.

Bentham (*B.Fl.* iii, 207) gives *E. acervula* Miq., as a synonym of *E. macrorrhyncha* F.v.M. This mistake has probably arisen through some confusion with *E. acervula* Sieb., although Bentham mentions "non Sieb." *E. acervula* Sieb., is a Stringybark (*E. eugenioides* Sieb.), and so is *E. macrorrhyncha* F.v.M.

10. *E. Gunnii* F.v.M. non Hook, f., in *Fragm.* ii, 62 (1860). This may be translated as follows:—

A tree, leaves alternate, moderately petiolate, narrow or ovate lanceolate or rightly ovate, coriaceous, shining, the same colour on both sides, spreading and prominently penniveined, narrowed into a long thin point or shortly acute, narrowed slightly inequilaterally at the base, the peripheral vein distant from the margin, umbels axillary, lateral and solitary, 3–7 flowered, rather long or rather shortly petiolate, the obconical semiovate tube of the calyx which has a rather long, or a short, or scarcely any pedicel is slightly longer or half as long again as the almost hemispherical shortly and rather obtusely acuminate and more

rarely rounded operculum; anthers subovate, style short, stigma depressed, fruits broad—or semiovate—turbinate, exangulate, 3–4 celled, the margin of the rim rather narrowly convex, the top of the capsule at first smooth, the deltoid valves enclosed or protruding close to the margin, the seeds without membranes. Growing in damp plains and valleys, and also in wet woody mountains here and there throughsunny Australia and Tasmania, extending towards the west to Guichen Bay, ascending into the Alps. A tree bearing the names " Red Gum Tree " and " Cider Tree " with the Tasmanians, and attaining the height of 150 feet (even on the tops of the highest mountains *e.g.*, Mt. Juliett) more often, however, much lower, in cold regions exposed to the wind, as near marshes on level ground it forms only a shrub, sometimes it flowers in the shrubby stage. The branches are shady enough. The trunk, flayed of its outer layers of bark, is mostly smooth and ash-coloured, retaining the old dark, ashy, furrowed bark full of clefts in the lowest part and more rarely also in the higher part. The younger branchlets tetragonous, the older ones somewhat rounded. Leaves 2–5 inches long, $\frac{1}{2}$–2 inches broad, in the summer scarcely ever transparently dotted, not seldom undulate. Peduncles slightly compressed, 3–10 lines long. Pedicels sometimes obsolete, sometimes up to 4 lines long. Calyx tube 2–4 lines long, often shiny, not angular. Operculum 2–3 lines broad, coriaceous, sometimes very much depressed, sometimes rather acutely and lengthily acuminate, often endued with brightness, the second fugacious calyptra sometimes given as about a line. Filaments slender, whitish, yellowish when dry, the longer ones measuring 2–3 lines. Anthers versatile, pale, $\frac{1}{4}$–$\frac{1}{3}$ line long, bilobed at the base, in flower pressed together almost like a little club. Style $1\frac{1}{2}$–2 lines long, somewhat thicker. Fruit 2–4 lines long, almost as broad at the top. Valves rising close to the margin of the vertex, longer or shorter than a line, eventually raised up. Sterile seeds $\frac{1}{3}$–1 line long, shining yellow, the longer ones clavelliform, the shorter rhombiform; fertile seeds oblong—or orbicular-ovate, convex at the back, somewhat flat in the front, blackish, faintly latticed.

This species sometimes approaches *E. viminalis*, sometimes *E. persicifolia* and *E. acervula*, perhaps also *E. acervula* J. Hook. Flowered in Tasmania l.c. and also embracing *E. daphnoides* Miq. Stirp. New Holland 37.

A rather gigantic tree, associated with and in the same places, *E. globulus*, near Sealer's Cove, called " Gum Top Tree," showing timber less durable than *E. globulus* but in other respects similar; it is distinguished by the old bark at the base of the trunk which is fibrous after the manner of that of *E. gigantea*. This huge tree will be referred to *E. Gunnii* with hardly any doubt. The Tasmanian tree called " Swamp Gum Tree," which I have not seen, perhaps belongs to the same place.

E. daphnoides Miq. is a synonym of *E. coccifera* Hook f. (See p. 143 Part V of the present work.)

This is not typical *Gunnii* Hook. f., but the Red Gum of Tasmania. It is clear what Mueller's plant is, from the description, but the matter is placed beyond any doubt by a specimen (which is *E. ovata*) in Herb. Kew, and which bears the label " *E. Gunnii* " in Mueller's handwriting, with *E. Stuartiana* Miq., and *E. Baueriana* Miq. as synonyms.

11. *E. paludosa* R. T. Baker, in *Proc. Linn. Soc. N.S.W.* xxiii, 167 (1898).

(*E. Stuartiana* F.v.M., var. *longifolia*, Benth., *B.Fl.* iii, p. 214). " Manna," " Yellow," " Ribbony," " Swamp," or " Flooded Gum."

A tree " not exceeding 80 feet in height " (Sir W. Macarthur), with a diameter 6 feet from the ground 1 foot 6 inches to 2 feet. In the young state up to a trunk of 5 to 6 inches, it is very similar to *E. viminalis* Labill. Bark brown at the butt, bluish-white on the trunk and main branches, and yellow on the smaller branches and limbs, decorticating into long ribbons of 30 feet or more suspended from the forks and trunks of the trees.

The lower young leaves opposite, sessile, ovate-acuminate, rarely cordate; the upper ones petiolate, irregularly opposite, lanceolate, venation distinct, oil-glands numerous, coriaceous, often shining and of a yellowish-green on both sides. Mature leaves on petioles rarely exceeding an inch, lanceolate-acuminate, varying in length up to 8 or 9 inches, coriaceous, lateral veins oblique, fairly numerous and equally prominent on both sides, but in some instances scarcely visible, the intramarginal vein removed from the edge in the broader leaves, but closer in the narrower ones, slightly shining on both sides, oil-glands not numerous, drying with a yellowish tinge.

Peduncles axillary, under ½ inch long, flattened, with 7 to 10 sessile flowers. Calyx tube 3 lines long. Operculum conical, shortly acuminate, much shorter than the calyx-tube. Stamens inflected in the bud. Anthers oblong, with parallel cells, the connective about half their length and prominent on both sides. Ovary half the length of the bud, placenta attached to the top and bottom of the ovary.

Fruit sessile, conical, truncate, with a ring just below the rim, 3- or 4-celled, valves not exserted.

Hab.—Monga (Braidwood, *W. Bäuerlen*); Delegate (Bombala, *W. Bäuerlen*); Wingecarribee (*W. Woolls*); Hill Top (*J. H. Maiden*); Barber's Creek (*H. Rumsey*).

In a paper (*Proc. Roy. Soc. Tas.* 1912, p. 149) Messrs. Baker and Smith state that *E. acervula* Hook. f. and *E. paludosa* R. T. Baker are specifically distinct, specifying the following differences :—

(*a*) The smooth bark of *E. paludosa* and the rough bark, "mostly" of *E. acervula*.

(*b*) Bushy top and leaves of rather pendulous growth of *E. acervula*, while *E. paludosa* "is a fine typical tree, with stout outstretching branches and a straight stem."

(*c*) The timber of *E. acervula* is harder, closer grained, and altogether superior to that of *E. paludosa*."

(*d*) "The oil of *E. acervula* does not agree entirely in general characters with that of *E. paludosa*."

Let us examine these points in detail.

(*a*) Rodway, *Tasmanian Flora*, p. 57, says of *E. acervula*, "Bark scaly below, smooth above." A field note of mine on a New South Wales specimen of Mr. Baker's *E. paludosa* is "fibrous at butt—a white gum." I know both trees, and at different times would describe them similarly.

(*b*) Hooker says of *acervula*, "trunk erect, often lofty." Personally, I have not been able to see any difference between *E. acervula* and *E. paludosa* in habit.

(*c*) It requires long experience of timber-workers to decide the relative merits of two timbers grown in different States.

(*d*) Some difference is to be looked for, and the value of the difference can only be ascertained after careful examination of the products of many trees. (Maiden in *Proc. Roy. Soc. Tas.* 1914, p. 25.)

12. *E. Gunnii* Hook. f. var. *elata* Hook. f. "arbor elata, foliis longioribus, umbellis plurifloris," under Tab. 7808 *Bot. Mag.* (1901).

Hooker gives figs. 3 and 4, in addition to the following synonymy :—

(*a*) *E. Stuartiana* F.v.M. ex Miq. in *Ned. Kruidk. Arch.* iv. 139, *Eucalyptographia*, Dec. iv.

(*b*) *E. persicifolia* Miq. l.c. (non Lodd)..

(*c*) *E. Baueriana* Miq. l.c., p. 137 (non Schau.).

(*d*) *E. falcifolia* Miq. l.c., p. 136 (*partim*).

(*e*) *E. acervula* Hook. f. Fl. *Tasman.* i, 135 (non Sieb.).

(*f*) *E. Gunnii* F.v.M. *Fragm*, ii, 62 (non Hook. f.).

This is interesting for two reasons, first on account of the complicated synonymy, and second because of the identification of var. *elata* with his own *acervula*, which indeed is correct.

The synonymy will be understood from what has gone before.

RANGE.

It occurs in four States, Tasmania, Victoria, South Australia, and New South Wales. It prefers cold, damp, undrained land, and will flourish in stagnant water, or in lands liable to be submerged for part of the year. Following the cold, it ascends to considerable elevations. In Tasmania it is diffused over the greater part of the island. In Victoria it is abundant along the southern and eastern districts, and ascends to central elevated localities. In South Australia it occurs in the Mount Lofty Range and about Mount Gambier. In New South Wales it occurs in the South Coast district and Southern Tableland at least as far north as Hill Top, and as far west as the highest parts of the Blue Mountains.

Tasmania.

The following numbered specimens from Gunn's Herbarium :—

(*a*) 1081 (1842), South Esk, 30 miles south of Launceston (C. Stuart).

(*b*) 1081 (1842), Marlborough, 17th October, 1840 (J. D. [afterwards Sir Joseph] Hooker). Both specimens in bud, flower, and young fruit.

(*c*) 1088, R. Gunn. In bud and flower.

(*d*) 1089, R. Gunn. Small tree, head of Ralph's Bay, V.D.L., 1840. In plump bud, flower, and fruit.

(*e*) 1093 (1842). Glen Leith, 2nd May, 1840. In bud, flower, and fruit.

(*f*) 1094. Another of the coarse-leaved specimens. Glen Leith, 8th December, 1839.

(*g*) 1096. With broad leaves. Glen Leith, 30th August, 1839. "Full flower, 1st August, 1839."

(*h*) 1096, R. Gunn. New Norfolk, V.D.L., 1842, labelled "*E. acervula*, Sieb." In bud, flower, and young fruit only.

(*i*) 1097, R. Gunn. Launceston, V.D.L., 1842. In bud, flower, and early fruit. This labelling, "*E. acervula* Sieb., R. C. Gunn., ex herb. Hook.," is attached to many specimens in European herbaria.

(*k*) 1097 (?). Penguite, 1st June, 1841. There is also a 1097, which is *E. viminalis*.

(*l*) 1098. Large tree (20 feet ?), bark rough, cracked, light brown. Hill at Head of Ralph's Bay, 13th October, 1840 (J. D. Hooker).

(*m*) No number. Near Mount Direction, 18th July, 1842.

Recherche Bay, near the extreme south of the Island. Labillardière collected here in 1802. Some leaves on a fruit-bearing twig 8 cm. long by as much as 4·5 cm. broad (J.H.M.). Southport, 1,900 feet (Charles Stuart). Southport, near sea-level (J.H.M.).

Adventure Bay, locality visited in January, 1777, on Cook's Third Voyage, by David Nelson and Mr. Anderson, Surgeon of H.M.S. "Resolution," who here collected the first Eucalyptus (*obliqua*) (J.H.M.).

Beltana, Hobart (R. H. Cambage and J.H.M.).

"*Eucalyptus Gunnii* Hook. f. "Red Gum" Van Diemensland Oldfield." In Miquel's handwriting. See *Ned. Kruidk. Arch.* iv (1856).

Derwent (Robert Brown, 1802–5). Also a similar specimen by the same collector labelled by Berlin *E. acervula* Miq.

With rather small fruits, Huonville (R. H. Cambage, No. 2547), 12 feet high, spreading, bark smooth, Richmond Road (L. Rodway); Kingston; Muddy Plains (Rodway); Mount Wellington (A. H. S. Lucas); River Derwent (Abbott); North West Bay. Broadish leaves (Cresswell).

One about 40 yards from the biggest was 60 feet at 4 feet from the ground, and at 130 must have been fully 40 feet in circumference; it was without buttresses, but went up one solid massive column, without the least symptom of decay. . . . The largest we measured was, at 3 feet from the ground, 102 feet in circumference, and at the ground 130 feet. We had no means of estimating its height, so dense was the neighbouring forest, above which, however, it towered in majestic grandeur. This noble Swamp Gum is still growing (1849) and shows no sign of decay. (Rev. T. J. Ewing in *Papers and Proc. R.S. Van Diemen's Land*, i, 165, 1851.)

The above magnificent trees were in the vicinity of the North West Bay River.

It is probably the largest tree in Tasmania. The following notes concerning it (the Swamp Gum) will be useful. Hooker quite pardonably confused the Swamp Gum with the Stringybark, and with his *E. gigantea*.

Hooker, in *Flora of Tasmania*, i, 132, refers to papers by Milligan, Mitchell, Watson, Hall and Ewing respecting . . . . "Swamp Gum, Stringybark." He says that:—

The Swamp Gum and Stringybark are perhaps both referable to my *E. gigantea* under which two species may be confounded by me, or the Swamp Gum may be some other species attaining a gigantic size in damp hollows. Mr. Mitchell describes the Swamp Gum as so very like *E. globulus* as not to be easily distinguished, but with smaller leaves and thinner bark, as being the largest of the genus, and growing twice as fast as *E. globulus*; he mentions 251 feet to the first branch. The stringybark he distinguishes by its much thicker fibrous bark; Mr. Milligan, however, adds in a note that this stringybark is the most gigantic of all, that it is well named *gigantea* by me. . . . Lastly, the Reverend Mr. Ewing gives details of a Swamp Gum tree, also hollow, found near Hobarton, which was 130 feet in circumference at the ground, and 102 feet at 3 feet above it.

"Black Gum," opercula pointed, Eastern marshes; also west of Cockatoo Valley (T. Stephens).

"Tasmania," probably Swanport (Dr. Story), with large, broadish leaves, and also with smaller leaves, Kelvedon, East Coast (J.H.M.).

Fruiting branches with leaves broad and coarse. Deloraine (J.H.M.).

With smaller leaves and fruits (correspondent of Mr. L. Rodway at Chudleigh, near Deloraine).

VICTORIA.

Lowland form (a) of *E. Gunnii*.—This form has been fully dealt with by Baron von Mueller, and I have only to add that it occurs throughout the littoral country. In the damp climate of west and south-western Gippsland it grows to a considerable height, say 150 feet with a straight clear bole, and was there cut by saw-millers, in one instance at any rate, as "blue-gum." In central and eastern Gippsland it does not grow to so great a height, but maintains its other characteristics. (Howitt, *op. cit.* p. 101.)

Not more than 20 feet high. The boles and limbs fairly smooth, except near the ground.

On sandy and clayey ridges at the beach on the western side of Lake Tyers where it exits into the sea (A. W. Howitt).

A dwarfish spreading tree locally called "White Gum." Rather common on the flats and low-lying flooded land about the Thompson River around Sale (H. Hopkins).

Following are specimens from the late Dr. A. W. Howitt, mostly from Gippsland localities:—

South Gippsland; "Swamp Gum," Gippsland; "Swamp Gum," banks of Latrobe River; "Swamp Gum" on clay flats, Traralgon; "Swamp Gum," Stratford; Alberton; Stony Creek, Dargo; Reedy Flat; Hubert's Corner, Upper Yarra; "Swamp Blue Gum," Lilydale.

Mt. Juliette, 4,000 feet. Trees, 150 feet. "Swamp Gum" opercula very abruptly pointed, East Malvern, Melbourne; Cheltenham (C. Walter); Somerville (J. Staer).

Anderson's Creek, "Lowland form." (Walter); "Swamp Gum," Dandenong Ranges (D. Boyle); Pakenham (E. Cheel); Kongwak and Powlett and Tarwin Plains to Foster. Also Otway district (A. E. Kitson).

Branxholme (D. McAlpine, 1889), determined by Mueller in connection with McAlpine's paper on petiole sections (*Trans. R. Soc. Vict.*, 1890). "Forms the whole of the forests in scattered trees from Branxholme to Hotspur. (Howitt.) Hawkesdale (H. B. Williamson). "*E. Stuartiana*," Curdie's Inlet, March, 1874 (Mueller); Port Fairy (J.H.M.); Gisborne (J. Staer).

"*E. Stuartiana*," "White Gum," Mt. Macedon, 1852, Mueller. The above in herb. Melb. Goulburn River, 1853; very large leaves. Mt. Macedon on trachyte (R. H. Cambage, No. 3665).

With fruits as hemispherical as those of Labillardière's specimens, Taradale (J. Blackburne); "*E. Stuartiana*" (original label), Bullarook Ranges, Ballarat; Marong (J. Staer).

Barwon, 1853 (Mueller), small fruits, sharp rim, domed.

Warrandyte (1880, C. Walter). Very similar to the preceding.

Oakleigh (Gessner). Small leaves, small buds, small fruits (not, however, fully ripe). Resembling the Barwon specimens a good deal. These small leaves may be the result of environment, or having been taken from the top of a largish tree.

South Australia.

Speaking generally, the specimens from this State have larger flowers and fruits than those of the other States.

There is a good figure in Brown's "Forest Flora of South Australia," under the name of "White Swamp Gum." This is multiflowered (up to 6, as shown in the plate), and the fruits are conoid-hemispherical. It is very common in Mt. Gambier low-lying swamp country (W. Gill).

It is identical with a specimen from Argyle Station, Mt. Gambier, collected by Mueller about 1847, and labelled "*E. viminalis*. Bark thick, scaly (schrundig) at butt." This is the kind of bark shown in Brown's plate. It is not rare in the species, and it is doubtless the "Cortex ramosus nigricanti cinereus" of *E. falcifolia* Miq. (*E. fabrorum*, F.v.M.) as defined in *Ned. Kruidk. Arch.* iv, 136 (*infra*).

Dr. Behr's No. 177, "Sud Australie, 1848," is labelled, evidently in a contemporary hand, "*Eucalyptus fabrorum* Schlect." The specimen is in bud only, and is in Herb. Barbey-Boissier. It has the buds of a pale olive-green colour.

Dr. Behr's specimen above referred to has buds mostly in 3's, but also in 4's. A specimen from Herb. Kew is labelled "*E. fabrorum* Schlecht. In mont. ster. elat. Nov. Holl. Austr. Nov. 1848. Dr. F. Müller. Herbar. W. Sonder. *E. viminalis* Lab., non *capitellata*," is probably Behr's also. It has buds up to six.

A specimen, "Swampy ground near Mt. McIntyre, Mt. Gambier," was formerly labelled *Stuartiana*.

Near Cape Northumberland (J. M. Black, No. 8), Mt. Burr Forest Reserve, near Millicent (W. Gill) (see Fig. 9*c*, Plate 113). Coarse foliage, very broad rim to fruit. Kuitpo Forest Reserve, near Willunga (W. Gill). "Six feet in diameter breast high; 90 feet high, among a patch of open forest of *E. rostrata*. Bark of a ribbony character. Hundred of Myponga, 45 miles south of Adelaide (Walter Gill).

This has the hemispherically-shaped fruits of typical *ovata*, with valves more exsert than the type. The buds are pointed, resembling those of *camphora*. The mature leaves are narrow to rather broadly lanceolate. Mr. Gill suggests crossing between *E. rostrata* and *E. ovata*. This may be so, and local observers can investigate. Morphologically, it points to the impossibility of keeping *E. ovata* and *E. camphora* as separate species.

These fruits have two rings to the rim like *E. camphora*. *E. ovata* and *E. camphora* especially run into each other in South Australia.

Glencoe, 15 miles from Mt. Gambier (W. Gill). The leaves are largish (neither broad nor narrow) and undulate (Fig. 2, Plate 114), and the buds and fruits very large. Except in size, they have the pointed and narrowed operculum common in *E. camphora*, differing only in size. The fruits are undoubtedly of the *ovata* type, with a tendency to the urceolate form so common in the species. Specimens with buds and fruits so large might be known as variety *grandiflora*.

New South Wales.

Southern localities.—" White Gum " (No. 2 of my notes), Brown's Camp, Delegate (W. Baeuerlen). Quite glabrous, many-flowered, operculum conical; nearly ripe fruit available, less conoid than usual; young leaves oblong-cordate, quite glabrous. Mr. Baeuerlen looked upon this as a hybrid.

Delegate River. 3,000 feet. Bark deciduous. Fruits less conoid than usual. (W. Baeuerlen's No. 217, May, 1889.) Near Delegate Hill. Broad leaves (W. Forsyth).

Delegate to Bombala. Shiny leaves getting broad, undulate (H. Deane and J.H.M.).

" Red Gum," Bombala. Bark deciduous (W. Baeuerlen, January, 1887).

Near Cathcart (H. Deane and J.H.M.). Very broad, leathery leaves, lanceolate, up to 4 or 5 inches long. Quite glabrous, both leaves and fruit.

" Hickory," because the timber is very tough. Twofold Bay (Lockhart Morton). " One of the largest trees of these parts."

" 40-60 feet. Bark ribbony from the base, even up to the upper branches. It has all the appearance of a " Grey Box," and is spoken of by some people as " Box," by others as " Blue Gum." The timber when freshly cut is white, no sapwood or heart wood varying in colour. Exceedingly soft and straight-grained." Wyndham, near Pambula (J. L. Boorman).

Intermediate leaves large, and in no way that I can see differing from those of *E. camphora*. Fruits conoid, valves sunk. Yarrangobilly, near descent to Caves (A. W. Howitt); Bega (W. D. Francis).

" Cabbage Gum," Nimbo Station, head of Queanbeyan River (H. Deane). " Flooded Gum," Queanbeyan (Mr. Deane's No. 413). Both these specimens are identical with the Twofold Bay tree.

Charley's Forest, Braidwood (W. Baeuerlen). One of the specimens labelled by Mr. Baker *E. paludosa*.

" Grey Gum," Bowning, on flats (A. Murphy). Very similar to the Charley's Forest specimen. Some of the fruits display a tendency to a *goniocalyx* shape.

Very tall trees, growing in flats, stem twisted, ribbony bark, more especially the tips of branches. Wingello to Barber's Creek, now Tallong (J. L. Boorman).

" Swamp Gum," Barber's Creek (H. Rumsey) (named *E. paludosa* by Mr. R. T. Baker).

" Creek Gum." Limbs clean, Marulan (A. Murphy). " Yellow Gum," Barber's Creek (H. Rumsey); Wingello (J.H.M.).

"Yellow Gum, on flats, Bowral to Goulburn" (W. Woolls), 50 or 60 feet.

"Swamp Gum." A small mallee-like tree, 10–15 feet, rough bark, stooling, forming clumps, growing in permanent water. Juvenile leaves ovate to orbicular. Mature leaves not long and of medium width. Buds in stellate umbels; opercula often very pointed and pale coloured. Fruits conoid to subcylindrical, valves exserted. Paddy's River, Wingello (A. Murphy, J. L. Boorman). Specimens like these show absolute transit between *E. ovata* and *E. camphora*. (See figs. 8 and 9, Plate 114.)

Bendooley, Berrima (J.H.M. and J. L. Boorman).

"Flooded or Ribbony Gum," Shepherd's Swamp, Hill Top (J.H.M.); The Peaks, Yerranderie (R. H. Cambage).

Western localities.—On the Lowther Road, Mt. Victoria, we have interesting specimens collected off the same tree, the series being most instructive. A pendulous Ribbony Gum. Juvenile leaves, broadish. Fruits conoid and domed; shiny bud, multiflowered; a combination of *ovata* and *maculosa*. Contemplation of a tree like this shows how difficult it is to separate *ovata* and *maculosa*. White Gum specimens from Mt. Victoria have the fruits somewhat like *maculosa*, but not so domed, and more conoid. The fruits also have some resemblance to *rubida*, but are multiflowered.

At Fairy Dell and other parts of Mt. Victoria there is "Swamp Gum" in abundance, with undulating leaves, which are sometimes very long, and with broad suckers. Buds shiny. The fruits in the unripe state have the truncate appearance so commonly seen in Victoria, South Australia, and other parts of New South Wales. The resemblance to *maculosa* is obvious.

"White Gum." Shiny, smallish, nearly sessile fruits, nearest to *acervula*. Mt. York (J.H.M.). Smooth-barked tree, broad juvenile leaves. Shiny buds, multiflowered. It is *E. ovata*, yet in the shape of the fruits showing undoubted affinity to *E. maculosa*. Mt. Wilson (Jesse Gregson, J.H.M.).

AFFINITIES.

Its affinities are with *E. Gunnii* Hook. f., and its relations (*E. maculosa* R. T. Baker, *E. rubida* Deane and Maiden), and I have so abundantly brought this under notice that there seems but little more to be said on this head.

1. With *E. Gunnii* Hook. f. Hooker himself in describing his *E. acervula* (*ovata*) says "the foliage is that of *E. Gunnii*," and as he originally described *E. Gunnii*, his opinion was worth something. Rodway says:

Eucalyptus acervula, Sieb. (should be Hook. f., non Sieb.). This is a very common Tasmanian Gum, and though in some respects nearly related to *E. Gunnii* is consistently distinct. Its habit and bark, its thinner undulate leaves and numerous flowers, its peculiar turbinate fruit, with protruding valves, make it very distinct, yet Mueller not only combines it in his Eucalyptographia with *E. Gunnii*, but rejects the type established by Hooker of that species and replaces it with a plate of the typical *E. acervula* Sieb. (Rodway in *Proc. R.S. Tas.*, 1898-99, p. 104.)

The reference to the Eucalyptographia plate is not quite accurate. The main twig and the cluster of buds on the left-hand top corner are both var. *acervula* (*ovata*). The rest of the illustrations are typical *Gunnii* and allied species. The conoid or turbinate fruit is a very useful character.

2. With *E. decipiens*. Speaking of *E. decipiens*, Endlicher writes :—

Facies omnino *E. obovatæ* Labill. (*E. ovatæ* J.H.M., *Nov. Holl.* t. 153, sed operculi forma et longitudine distinctissima.) (*Enum. Pl.* . . . . *Hugel*, p. 49.)

From the figures in Plate 63 of *E. decipiens* (Part xiv), it will be seen that the comparison is a very proper one. The foliage of the two species is a good deal alike, but the fruit is very different.

Mr. Baker [*Proc. Linn. Soc. N.S.W.*, xxiii, 168 (1898)] places his *E. paludosa* (*E. ovata*) between *E. saligna* Sm., and *E. punctata* DC.

Variety.

Var. *camphora*, var. nov.

In stating that, in my opinion, there is no character by which *E. ovata* can be satisfactorily separated from *E. camphora*, I have no option but to propose that the former be regarded as a variety of the other. In saying this, I am quite prepared to learn that botanists who are only acquainted with extreme forms, and have not examined such a series as has been brought together in the National Herbarium, may not be able to agree with me.

E. camphora R. T. Baker [*Proc. Linn. Soc. N.S.W.*, xxiv, 298 (1899)].

A rather small tree, about 20 to 30 feet high, with a black decorticating bark. Young leaves ovate, obtuse, under 6 inches long, 3½ inches broad, on angular petioles of ½ inch, coriaceous, glaucous. Mature leaves ovate-elliptical, abruptly acuminate under 4 inches long, or lanceolate, acuminate, and 6 inches long; thinly coriaceous, glaucous venation distinct, particularly so in young leaves, intramarginal vein removed from the edge. Peduncles few, axillary, flattened, bearing 5 or 6 shortly pedicellate or sessile buds. Calyx turbinate, inclining to hemispherical, 1 line long, 1 line broad; operculum acuminate, about 2 lines long. Ovary domed. Anthers parallel, opening by longitudinal slits. Fruits small, turbinate, 3 lines long, 2 lines in diameter, rim flat, valves exserted.

It is a very umbrageous tree, attaining a height from 30–60 feet and a diameter up to 3 feet, usually rather crooked and essentially a swamp or wet ground species. Occurs also on the banks of creeks or rivers, as for instance at Delegate on the banks of the Delegate River, usually associated with *E. stellulata* and *E. paludosa*. From the former it is quite easily distinguished by its leaves, although otherwise in appearance of growth, branches, bark, &c. the two resemble each other somewhat. Its branches never have, however, that yellow-green colour which distinguishes *E. stellulata* so readily, but are of an ashy-grey or brownish-grey colour; sometimes approaching even to a sooty-black. The persistent bark is also of a different texture, while in *E. stellulata* on very old trees it approaches almost that of an Ironbark. From *E. paludosa* R.T.B. it is easily distinguished, especially in older trees, but the leaves are broader and rounder, often considerably broader than long, and the apex quite blunt, sometimes obcordate. The leaves on the higher branches approach more those of *E. melliodora* than perhaps those of any other species. *E. paludosa* is not so essentially a swamp or wet ground species, as it occasionally occurs on dry ground; it also grows a larger tree and is more apt to be straight than this new species; the persistent bark is also quite different and decorticates in long flakes. When young trees of it and *E. paludosa* are seen growing in company the two are not likely to be confounded, as the young leaves and bark of each species are quite different.

Like *E. paludosa*, it has very probably been classified with *E. Gunnii* Hook. f., but it differs from this latter species in leaves, fruits, timber, oil, &c. The colour of the bark and the disposition of the buds bear some resemblance to *E. stellulata*, but it does not resemble it in any other characters. (*op. cit.*)

The principal botanical characters to be observed in a large number of specimens are :—

Juvenile leaves. The same as those of *E. ovata*, but may attain a larger size.

Mature leaves. Long or short petioles, sometimes very long. Lamina sometimes very large and broad. Sometimes emarginate. Sometimes not broad, undulate.

Buds. Operculum acute, and often constricted.

Fruits. Small, turbinate to urceolate, pedicellate to nearly sessile.

Rim flat or slightly domed; often with a double raised ring. Valves usually markedly exsert, but not always so.

RANGE.

It is confined to Victoria and New South Wales, so far as is known at present, and usually in very cold, and always in damp situations. It is not rare in the high country of North East Gippsland and of the Monaro. The Rylstone district is by far the most northerly locality recorded so far, and probably that of greatest average temperature.

VICTORIA.

Goulburn River. 1853. Very broad leaves, fruits not available (Mueller).

" Tall form *E. Gunnii*," Upper Livingstone Creek, Gippsland (A. W. Howitt).

" Falck's timber specimen, No. 13, August, 1879," from Beechworth, with acuminate leaves. Bright district, " Swamp Gum " (J.H.M.).

Omeo to Mt. Hotham, 3,000–4,000 feet (R. H. Cambage, No. 3,682).

Stony Creek, Dargo (A. W. Howitt). With leaves of typical *camphora*, but with the fruits of small-fruited *ovata*.

Bendoc (W. Forsyth).

It is the tall mountain form (*c*) of *E. Gunnii* of Howitt. " This much resembles some of the lowland varieties, which grow upon dry tracts of land; but the leaves are shorter, more ovate, smoother, thicker in consistence, and rarely have the wavy margin which is characteristic of the tall lowland form. Its lower limit is probably about 600 feet above sea-level, but I think it possible that the tall lowland form interningles with it at that elevation, or less." (Howitt, *op. cit.*, p. 102.)

Perhaps the present is an opportune time to inquire into Howitt's views in regard to the *E. Gunnii* series, in an important paper.

He says (" The Eucalypts of Gippsland," *Trans. Roy. Soc. Vict.* ii, 101, 1890) " *E. Gunnii.* This type is very widely spread over Gippsland, not only in horizontal range, but also in elevation above the sea-level. I have observed a lowland and a highland form, and each of them has a dwarf variety."

It was no fault of Howitt's that his terminology was wrong, that he was in advance of Mueller's nomenclature. It is sufficient to say that he was in advance of his time, and that no one wrote more accurately from field knowledge of the Gippsland Eucalypts than he did. With the experience of a quarter of a century of added knowledge, it is a pleasure and most instructive to read even now Howitt's paper under reference. The four forms he attributes to *E. Gunnii* are (p. 101) :—

1. " Lowland form " (*a*). This is *E. ovata* (*acervula*).

2. " Dwarf variety " (*b*). This is *E. Kitsoni* Maiden.

3. " The tall Mountain Form " (*c*). This is *E. camphora* R. T. Baker.

4. " Dwarf Highland Form" (*d*). This is *E. neglecta* Maiden. Mr. Baker (*Proc. Aust. Ass. Adv. Science* xiv, 299, 1913) surmises that it is his *E. camphora.*

Mr. Howitt looked upon *E. ovata* (*acervula*) as the type of *E. Gunnii,* just as Mueller figured it in his " Eucalyptographia."

When we come to *E. viminalis* (p. 97) we find that Howitt confused some of the *E. Gunnii* forms with *E. viminalis,* thus :—

(*a*) is typical *E. viminalis.*

(*b*) is *E. rubida* Deane and Maiden.

(*c*) (p. 100.) This is *E. maculosa* R. T. Baker, with but little doubt.

New South Wales.

Bombala (W. Baeuerlen, No. 556). Mr. Baker says that this is his *E. camphora,* but I cannot distinguish it from *E. ovata.* Leaves not broad, valves of fruit hardly exsert, Brown's Camp, Delegate, and " Bastard or Flooded Gum," Delegate (both W. Baeuerlen). I many years ago labelled these Delegate specimens, " Highland form of *E. Gunnii.*" Conical, very exserted fruits; very pointed operculum; large broad, thickish leaves, Delegate Mountain (W. Baeuerlen); Haydon's Bog, Delegate (W. Forsyth); opercula not constricted, near Tumut (R. T. Baker); Yarrangobilly (A. W. Howitt). Tumberumba (H. Deane). " Broad-leaved Sally," Cockatoo, near Germanton (W. Forsyth). Condor Creek, Queanbeyan (R. H. Cambage, No. 3,342), one leaf $12\frac{3}{4}$ inches long without petiole, 14 inches with petiole, width $3\frac{1}{2}$ inches.

Twenty-two miles south-westerly from Oberon (R. H. Cambage). Ganguddy Creek, Kelgoola, also Nullo Mountain, Rylstone (R. T. Baker).

DESCRIPTION.

CXLIV. E. neglecta Maiden.

In *Victorian Naturalist* xxi, 114 (1904).

A tree of small size.

Bark.—"The bark is that of *E. Gunnii*" (A. W. Howitt, in litt.)—*i.e.*, smooth and ribbony.

Juvenile Foliage.—Ovoid or oval, cordate at the base, and stem-clasping (sessile); pale green, of the same colour on both sides. I have leaves of this kind $\frac{7}{8}$ and $1\frac{1}{4}$ inches broad. The leaves may remain sessile and of the same shape for a considerable period—*i.e.*, until they attain the texture of mature leaves and a diameter of nearly 3 inches.

Mature Foliage.—In dried specimens of a greasy lustre, broadly lanceolate to nearly orbicular. Sessile to petiolate, with a petiole of an inch or more. Base of leaf tapering into the petiole or cordate. Apex of leaf rounded or tapering to a blunt or even a sharp point. Margin often more or less crenulate, particularly in young leaves. Midrib very prominent, the lateral veins distant and roughly parallel, and making an angle of about 45 degrees with the midrib. Twigs round to nearly quadrangular.

Buds.—Blunt, almost ovoid, and small; operculum tending to be slightly conical; glaucous.

Fruits.—Nearly hemispherical, small, say $\frac{3}{16}$-inch in diameter, rim prominent, tips of valves rather well exserted, valves four in my specimens. Fruits sessile on a short strap-shaped common peduncle, from three to eight or nine in a head, in the axils of the leaves.

RANGE.

Confined to Victoria, so far as we know at present. It grows in swampy places in the upper parts of Livingstone Creek, near the Great Dividing Range, about 20 miles up the stream from Livingstone, usually called Omeo (A. W. Howitt, who collected the specimens, and from whom I received them).

It is the "Dwarf Highland form (*d*)," of *E. Gunnii*, according to Howitt, in the following passage:—

I have observed this form of *E. Gunnii* growing extensively in the swampy flats at the source of the main branch of the Livingstone Creek, at an elevation of about 3,000 feet.

The description given of the dwarf lowland form applies in many respects to this also. It does not exceed 20 feet in height; the bark is smooth, persistent at the butt, and smooth and greenish on the branches. The leaves are ovate, and at first opposed and sessile, or nearly so, finally scattered, of a dull green. The umbels are axillary, or solitary, of sessile crowded buds. Fruit, semi-ovate rim, rather broad and slightly convex, the valves barely exserted. The young twigs and umbels are all slightly mealy. This form, however, differs from the corresponding lowland one in the leaves being shorter and broader when they become scattered, in the darker green of the foliage, and the smaller size and mealy character of the buds. The fruit also is of a smaller size. (Howitt, *Trans. Roy. Soc. Vict.* ii, 102, 1890.)

Having no specimens to spare, I wrote out a brief description of the plant for Mr. H. Hopkins, of Bairnsdale, and asked him to look out for it. He not only found the first specimens that had been collected since Howitt obtained the type, but favoured me with the following descriptions, which are worth reproducing, although they overlap somewhat:

1. A small "scraggy" tree 12 to 20 feet in height, only on moist ground along the very edge of the creek, or on flooded flats where it grows more or less in clumps containing from a dozen to hundreds of slender saplings forming a dense thicket, a mass of dark green foliage, often with considerable bluish "bloom" on the young branchlets and leaves similar, but not so much so as the blue gum. These clumps are seldom more than 10 or 12 feet high, but up to twice that in diameter. The stems appear to be independent saplings and not suckers from a common crown. The younger shoots and branchlets are frequently, or even commonly quadrangular. The leaves are broad, thick, and opposite, except on the ends of the older branches where they are generally, not always, more elongated, stalked and alternate. On the lower branches, suckers and young saplings, the leaves are frequently sessile, and always opposite. The buds are rather small, in dense clusters, axillary, without stalks, and very profuse. On the older trees the bark, and especially the fruits, are almost black, of a "sooty" appearance, so that the crooked scraggy tree, with its dense leathery, dirty green or rusty old leaves, is generally a dirty looking object—but the "clumps" apparently of younger trees are bright, green, and beautiful to look upon. The bark on the older trees is slightly fibrous, very thin, and resembles the bark on a 5 or 6 year old sapling of the typical *E. amygdalina*. But the general appearance of the tree with its mixed foliage of coarse leaves, and clusters of fruits resembles the coarser type of *E. cinerea*.

From Upper Livingstone Creek, 18 miles from Omeo, on the Omeo-Dargo track.

2. Seldom more than 6 inches diameter, crooked and many branched, with thin ribbons of bark hanging to the branches and upper part of the stem, on the lower part the bark is "mealy rough," or slightly fibrous, like many "peppermint" saplings (*E. amygdalina*). It grows only on moist ground and appears to be confined to the very margin of the Creek, and to low flooded flats. In the latter situation it is only a tall shrub growing in thickets or almost circular clumps, perhaps up to a chain in circumference of hundreds of saplings from 1 to 3 inches in diameter and up to 10 or 12 feet high, forming a dense thicket. I enclose a photograph showing these "clumps." The leaves are dull green or young leaves with a bluish tint—thick and coarse, broad and oval shaped, on suckers and young shoots generally sessile, or almost stalkless, and generally on very short stalks, almost all opposite. The young stems and branchlets are frequently or usually "square" but slender, and often covered with a bluish tint, somewhat like blue gum, but not so strong. Apparently this tree is confined to a small area in the Valley of the Livingstone Creek. I only saw it for about 1 mile in length along the creek, although it may occur higher up. Possibly it may occur in the Valley of the "Wentworth" River, which is only about 5 or 6 miles distant at this point, and along other streams in the same zone, but I have never seen it anywhere else.

AFFINITIES.

1. With *E. Kitsoni* Luehmann.

It differs in the juvenile leaves. There is a general resemblance in the mature foliage, but the leaves of *E. Kitsoni* are narrower, lanceolate, and more markedly veined. The buds are larger and more angular in *E. Kitsoni*, while the fruits are considerably different.

2. With *E. camphora* R. T. Baker (*E. ovata* Labill., var. *camphora*).

Mr. Baker thinks that *E. neglecta* is a form of his *E. camphora* (*Proc. Aust. Assoc. Adv. Science* xiv, 307, 1913).

I do not concur in this, although I look upon it as an aberrant form whose precise position has not been yet assigned. Although in *E. camphora* the pedicels are exceptionally quite short, they are never sessile; the shape of the buds and fruits appears to be different to those of *E. camphora*, and in that species (variety) there is no square or angled stem as in *E. neglecta*. *E. neglecta* is more or less glaucous.

3. With *E. Gunnii* Hook. f.

E. neglecta displays in bark, juvenile foliage, &c., considerable resemblance to the above species, but the fruits are quite different. The general similarity is, however, so evident that, if hybridism be a factor in the evolution of the present species, the widely-diffused *E. Gunnii* may well be supposed to have relationship with this new form.

4. With *E. ovata* Labill.

In the passage recently quoted Howitt says "the description of the Dwarf lowland form of *E. Gunnii* (*E. ovata*) applies in many respects to this also."

5. With *E. aggregata* Deane and Maiden.

With *E. aggregata* the affinity is less close.

In *E. aggregata* the juvenile foliage is narrower, more oval, and less, if at all, cordate at the base, the venation is more spreading, the buds are more slender, with narrower peduncles and longer (though not long) pedicels (often the fruits of *E. aggregata* are quite capitate), the twigs are less quadrangular, the fruits smaller, and have (apparently) a greater tendency to have the valves in 3's.

6. With *E. incrassata* Labill. var. *conglobata*.

The resemblance of *E. neglecta* to the above variety is worthy of note; the resemblance of *E. Kitsoni* to the variety is closer.

7. With *E. decipiens* Endl. (See Plate 63.)

The two species have much in common. The operculum of *E. decipiens* is longer and the anther shorter. The juvenile foliage of that species is broader and almost orbicular, and the fruit less flat. Further comparisons require to be made. *E. decipiens* is Western Australian.

Explanation of Plates (112–115).

PLATE 112.

E. maculosa R. T. Baker.

1*a*. Leaf; 1*b*, fruit and back views of anther; 1*c*, fruits, near Swan Reach, Victoria. (J.H.M.)

2*a*. Intermediate leaves; 2*b*, buds. Dargo Road, near Cobbannah Creek, Victoria. (H. Hopkins.)

3*a*. Leaf; 3*b*, small globular buds of Mr. Baker's variety A. Bungendore, N.S.W. (W. Baeuerlen.)

4*a*. Leaf; 4*b*, immature fruits; 4*c*, fruits, attenuated at the base like *E. ovata*. Wingello, N.S.W. (J. L. Boorman.)

5. Very small fruits (the buds with pointed opercula). Federal Capital Site, Queanbeyan. (R. H. Cambage, No. 2,938.)

6*a*. Juvenile leaf; 6*b*, mature leaf, buds and flowers; 6*c*, fruits of two different sizes. Reproduced from the original figure of the type. (Plate 44, *Proc. Linn. Soc. N.S.W.* xxiv.)

7*a*. 7*b*, varying juvenile leaves. Mt. Victoria, N.S.W. (J.H.M.)

8*a*. 8*b*, Juvenile leaves, varying in width; 8*c*, mature leaf; 8*d*, fruits of a form which seems to exhibit transit between *E. maculosa* and *E. ovata*. Mt. Wilson, N.S.W. (Jesse Gregson.)

9*a*. Buds; 9*b*, immature fruits, of a form which seems to be intermediate between *E. maculosa* and *E. ovata*. Mt. Victoria, N.S.W. (J.H.M.)

10*a*. Buds; 10*b*, fruits of *E. maculosa* var. B. (*E. lactea* R. T. Baker). Oberon Road, O'Connell, N.S.W. (R. T. Baker.)

11*a*. Leaf with buds; 11*b*, anther of *E. lactea* R. T. Baker. Ilford, N.S.W. (R. T. Baker.)

12*a*. Buds; 12*b*, fruits. Note the broad peduncle, and the flat-rimmed hemispherical fruits. Frederica Falls, Lawson, Blue Mountains, N.S.W. (R. T. Baker.) This is the locality with lowest vertical height known to me, New South Wales, for this species.

E. præcox Maiden.

13*a*. Juvenile leaves; 13*b*, mature leaf; 13*c*, buds; 13*d*, back and front views of anther; 13*e*, twig, shows the fruits while still in the broad-leaved (juvenile) stage. Capertee, N.S.W. (J.H.M. and J. L. Boorman.)

PLATE 113.

E. ovata Labill.

1*a*. 1*b*. Portions of the drawing of the type. Labillardière's *Plantæ Novæ Hollandiæ*, Vol. ii, Plate 153.

2. Leaf of a specimen belonging to Labillardière ex herb. De Candolle. It is labelled "*E. ovata* Labill. Eucalyptus, Terre de Diemen, Museum de Paris, 1821."

3*a*. 3*b*. Mature leaves; 3*c*, fruits, being a portion of a drawing by Miss M. Smith from the original specimen in the Kew Herbarium labelled "*Eucalyptus ovata* Labill. Van Dieman's Land. Received from Gunn." The drawing was submitted to Mr. L. Rodway, Government Botanist of Tasmania, who stated that it is=*E. acervula* Hook. f., non Sieber, and sent me Tasmanian specimens which precisely match the drawings. I fully concur in the opinion, for I have abundant material collected by others and myself in Tasmania which make such a conclusion unavoidable.

4*a*. Juvenile leaf; 4*b*, front and back view of anther; 4*c*, fruits. Adventure Bay, Tasmania. (J.H.M.) This is an historical locality, as it is the place visited by Captain Cook in his third voyage, 1777.

5*a*. Leaf; 5*b*, immature buds; 5*c*, buds and an expanded flower; 5*d*, fruits of 1088 Gunn, a co-type of *E. acervula* Hook. f., non Sieber. See p. 142.

6. Fruits of 1098 Gunn, Hill and Head of Ralph's Bay, Tasmania. See p. 143.

7*a*. Narrow mature leaf; 7*b*, broader mature leaf and buds; 7*c*, fruits of No. 1089 Gunn, Head of Ralph's Bay. See p. 142.

8*a*. Narrow mature leaf; 8*b*, buds; 8*c*, fruits, nearly sessile. Southport, Tasmania, at an elevation of 1900 feet. (Charles Stuart.)

9*a*. Juvenile leaf; 9*b*, mature leaf; 9*c*, fruits. Note that they are getting turbinate and compare 4*b*. Mt. Burr Forest Reserve near Millicent, S.A. (Walter Gill.)

PLATE 114.

E. ovata Labill.—*continued.*

1*a*. Narrow mature leaf; 1*b*, broad mature leaf; 1*c*, buds with long pointed opercula; 1*d*, fruits. Note the flat and domed rims and the very exserted valves. In the original description of *E. acervula* Hook. f., it is stated that the valves are sunk; the description of *E. ovata* is not so explici Myponga, 45 miles from Adelaide. (W. Gill.)

2*a*. Mature leaf; 2*b*, buds; 2*c*, front and back views of anther; 2*d*, fruits of the large-fruited form which I have adopted as variety *grandiflora*. See p. 146. Glencoe, 15 miles from Mt. Gambier, S.A. (W. Gill.)

3*a*. Buds; 3*b*, fruits. Port Fairy, Victoria. (J.H.M.)

4*a*. Leaf and buds; 4*b*, fruits, side and end views. Oakleigh, Victoria. (Gessner.)

5*a*. Buds; 5*b*, leaf and fruits. Barwon, Victoria. (Mueller, 1853. This specimen was variously labelled *Gunnii* and *Stuartiana* by Mueller.

Specimens 4 and 5 are an unusually small-organed form of *E. ovata*.

6*a*. Juvenile leaves; 6*b*, mature leaf; 6*c*, young buds; 6*d*, immature fruits of *E. paludosa* R. T. Baker (taken from figure of type, Plate vi, *Proc. Linn. Soc. N.S.W.* xxiii, 1898).

7*a*. Juvenile leaves; 7*b*, immature fruits, Brown's Camp, Delegate, N.S.W. (W. Baeuerlen.)

8*a*. Pointed buds; 8*b*, fruits, Wingello, N.S.W. (A. Murphy.)

9*a*. Juvenile leaves; 9*b*, mature leaf; 9*c*, buds; 9*d*, fruits. Paddy's River, Wingello. (J. L. Boorman.) Nos. 8 and 9 are described fully at p. 147.

10*a*. Juvenile leaf; 10*b*, buds; 10*c*, fruits. Shepherd's Swamp, Hill Top, N.S.W. (J.H.M.)

11*a*. Mature leaf; 11*b*, small sessile fruits. Mt. Victoria, N.S.W. (J.H.M.)

PLATE 115.

E. ovata Labill. var. *camphora* new variety. (*E. camphora* R. T. Baker).

1*a*. Broad mature leaf (compare 3*a*, Plate 113); 1*b*, fruits (compare 1*d*, Plate 114). Bright district Victoria. (J.H.M.)

2*a*. Narrow mature leaf and buds; 2*b*, front and back view of anthers; 2*c*, fruits (compare 9*c* and 9*d* Plate 114); 2*d*, smaller buds; 2*e*, smaller, immature fruits. Brown's Camp, Delegate, N.S.W (W. Baeuerlen.)

3*a*. Nearly juvenile leaf; 3*b*, mature leaf; 3*c*, buds; 3*d*, 3*e*, fruits, from Plate 22, Vol. xxiv, *Proc. Linn. Soc. N.S.W.* (1899) of the original drawing of *E. camphora* R. T. Baker.

4. Large leaf, with long petiole. 22 miles south-west of Oberon, N.S.W. (R. H. Cambage.)

E. neglecta Maiden.

5*a*. Juvenile leaf (with square stem); 5*b*, intermediate leaf; 5*c*, mature leaf; 5*d*, sessile buds and flower; 5*e*, front and back view of anthers; 5*f*, fruits of the type. Upper Livingstone Creek, Omeo, Victoria. (A. W. Howitt.)

The following species of Eucalyptus are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets :—

acacioides A. Cunn (xlviii).
acmenioides Schauer (xxxii).
affinis Deane and Maiden (lvi).
amygdalina Labill. (xvi).
Andrewsi Maiden (xxi).
Baileyana F.v.M. (xxxv).
Baueriana Schauer (lvii).
Baueriana Schauer, var. *conica* Maiden (lviii).
Behriana F.v.M. (xlvi).
bicolor A. Cunn. (xliv).
Boormani Deane and Maiden (xlv).
Bosistoana F.v.M. (xliii).
Caleyi Maiden (lv).
capitellata Sm. (xxviii).
Consideniana Maiden (xxxvi).
coriacea A. Cunn. (xv).
corymbosa Sm. (xii).
crebra F.v.M. (liii).
dives Schauer (xix).
fruticetorum F.v.M. (xlii).
gigantea Hook. f. (li).
goniocalyx F.v.M. (v).
hæmastoma Sm. (xxxvii).
hemiphloia F.v.M. (vi).
longifolia Link and Otto (ii).
Luehmanniana F.v.M. (xxvi).
macrorrhyncha F.v.M. (xxvii).
maculata Hook. (vii).
melanophloia F.v.M. (liv).
melliodora A. Cunn. (ix).
microcorys F.v.M. (xxxviii).
microtheca F.v.M. (lii).
numerosa Maiden (xvii).
obliqua L'Hérit. (xxii).
ochrophloia F.v.M. (l).
odorata Behr and Schlechtendal (xli).
paniculata Sm. (viii).
pilularis Sm. (xxxi).
piperita Sm. (xxxiii).
Planchoniana F.v.M. (xxiv).
polyanthemos Schauer (lix).
populifolia Hook. (xlvii).
punctata DC. (x).
regnans F.v.M. (xviii).
resinifera Sm. (iii).
saligna Sm. (iv).
siderophloia Benth. (xxxix).
sideroxylon A. Cunn. (xiii).
Sieberiana F.v.M. (xxxiv).
stellulata Sieb. (xiv).
tereticornis Sm. (xi).
virgata Sieb. (xxv).
vitrea R. T. Baker (xxiii).

* Government Printer, Sydney. 4to. Price 1s. per part (10s. per 12 parts); each part containing 4 plates and other illustrations.

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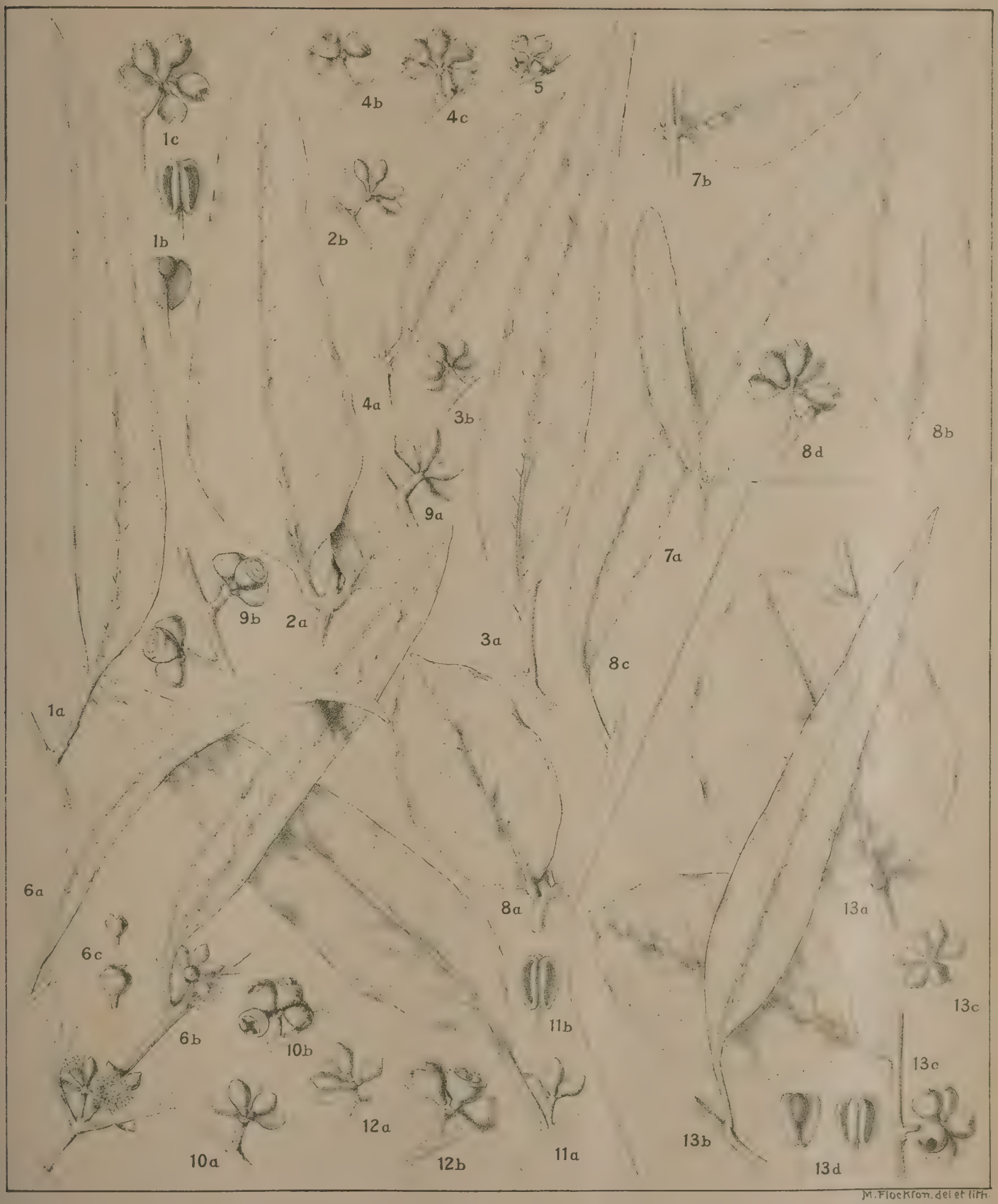

EUCALYPTUS MACULOSA R. T. BAKER (*1–12*).

E. PRAECOX MAIDEN (*13*).

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EUCALYPTUS OVATA LABILL. [See Plate 114.]

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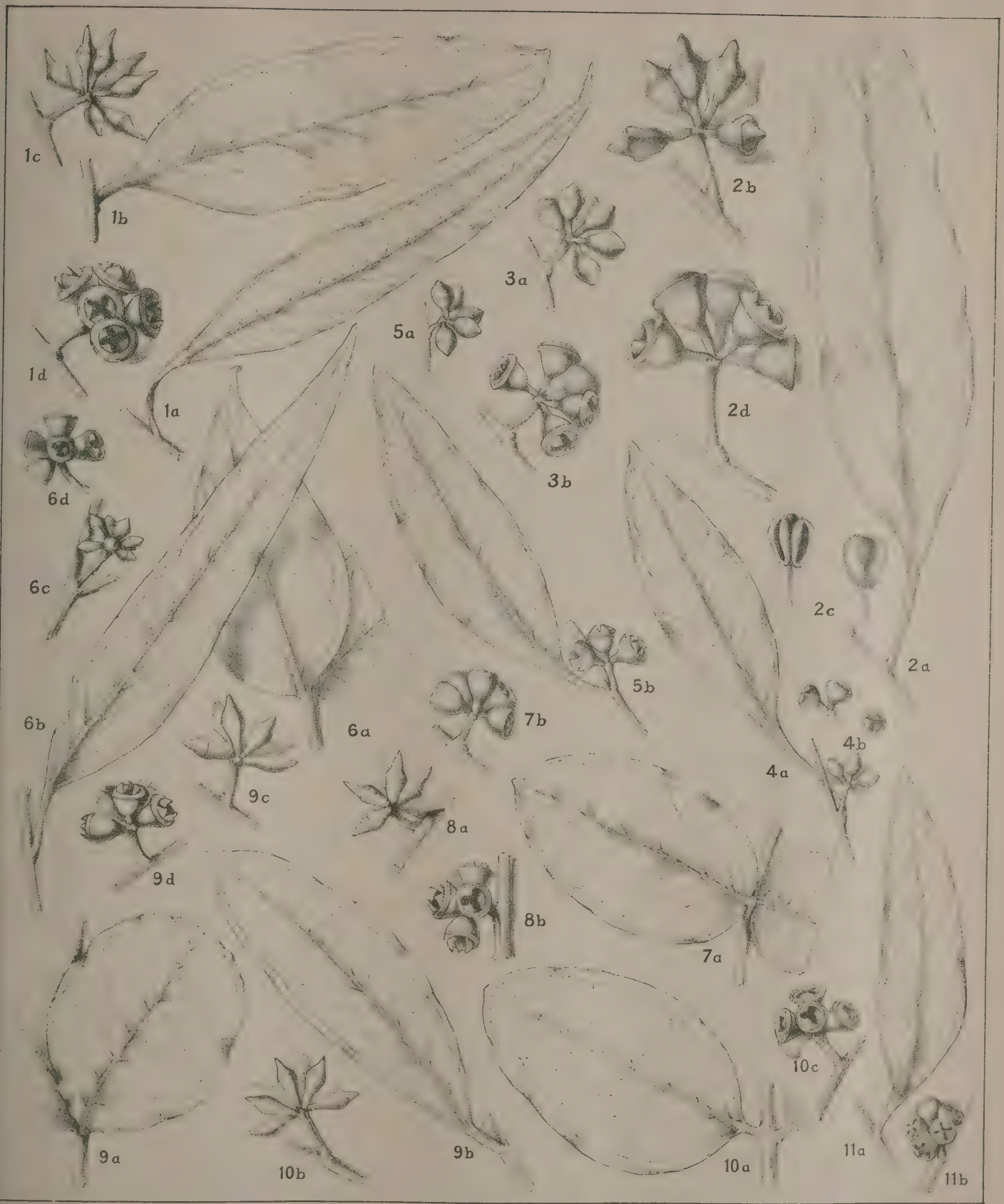

EUCALYPTUS OVATA LABILL. [See Plate 113.]

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EUCALYPTUS OVATA LABILL. *var.* CAMPHORA *n. var.* (*E. camphora* R. T. BAKER) (*1–4*).

E. NEGLECTA MAIDEN (*5*).

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A Critical Revision of the genus Eucalyptus

BY

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.

(Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney).

Vol. III. Part 8.

Part XXVIII of the Complete Work.

(WITH FOUR PLATES.)

"Ages are spent in collecting materials, ages more in separating and combining them. Even when a system has been formed, there is still something to add, to alter, or to reject. Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages. In these pursuits, therefore, the first speculators lie under great disadvantages, and, even when they fail, are entitled to praise."

MACAULAY'S "ESSAY ON MILTON."

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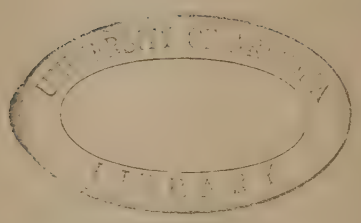
1916.



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DESCRIPTION.

CXLV. E. vernicosa Hook. f.

In *London Journal of Botany* vi, 478 (1847).

Ramis validis, ramulis acute angulatis foliis alternis parvis uniformibus breviter petiolatis crasse coriaceis late elliptico-oblongis utrinque obtusis mucronulatis nitidis vernicosis, pedunculis brevissimis 1–3–floris, alabastris sessilibus late obconicis, operculis cupulam subæquantibus conico-hemisphericis subrostellatis, capsulis hemisphericis ore non contracto plano v. depresso.

Hab.—Mount Fatigue, altitude 4,000 feet. Gunn.

Arbor parva, 4–pedalis, in convallibus 15–pedalis. Rami erecti, robusti, rugulosi, cicatricati; ramulis plerumque tetragonis, angulis acutis. Folia breviter petiolata, petiolo $\frac{1}{4}$ unc. longo, lamina uncialis, $\frac{3}{4}$–$\frac{7}{8}$ unc. lata, valde rigida, coriacea, apice rotundata apiculata, sicca flavido-virescentia nitida, obscure nervosa. Pedunculi brevissimi, crassi, vix $\frac{1}{8}$ unc. longi v. sub-nulli. Alabastra $\frac{1}{3}$ unc. longa, sicca rugosa. Capsula $\frac{1}{3}$ unc. longa, ad orem aequilata obconico-hemispherica.

In *Fl. Tas.* i, 135 (1860), Hooker re-described his species in the following words :—

Arbuscula glaberrima vernicosa nitida, ramis ramulisque erectis robustis, foliis parvis erectis breve petiolatis exacte oblongis ellipticis rotundatisve apiculatis crassissime coriaceis, pedunculis crassis brevissimis 1–3–floris, calyce late obconico v. oblongo operculum conico-hemisphæricum subrostellatum æquante, capsula hemisphærica ore non contracto plano v. depresso. (*Gunn*, 1113.)

Hab.—Summit of Mount Fatigue, elev. 4,000 feet, *Milligan, Gunn* (Fl. April).

A very peculiar and most distinct form, perhaps the smallest of the whole genus, quite unlike any other Tasmanian one, though, all the specimens being from but one locality, some allowance must be made for deviations from the description. Gunn describes it as forming a bush 1–4 feet high, though he suspects that some trees of 15 feet, which he saw in rocky, sheltered places, may be the same. *Branches* very stout, erect, covered with dark, red-brown, rough bark; branchlets angled. *Leaves* erect, $\frac{1}{2}$–$1\frac{1}{2}$ inch long, excessively thick and coriaceous, shining as if varnished on both surfaces, oblong or elliptical or orbicular, apiculate, petioled. *Peduncles* very short and thick, one- to three-flowered. *Calyx* oblong or obconic, with a broad, conical, almost rostrate operculum. *Peduncles* generally many-flowered. *Operculum* considerably shorter than the calyx.

Then Bentham (B.Fl. iii, 232, 1866) also described it in English, but a little more fully than the original describer.

Then we have two interesting notes by Rodway :—

1. "This interesting Eucalypt on Mt. La Perouse, attains a height of 20 feet. The leaves are all opposite and the flowers solitary in the axils. These features I found constant for the whole country from the Hartz through Adamson to Perouse, a distance of about 30 miles.

"On the West Coast the smaller forms retain the opposite leaves, but the flowers are three together on short peduncles. On Mt. Geikie the taller plants bear larger alternate leaves, but with smaller flowers." (*Proc. Roy. Soc. Tas.*, 1898–9, p. 104.)

2. *E. vernicosa* H. Erect shrub, 4–6 feet, rarely 12–20. Bark smooth. Leaves thick, shining, equal-sided, broadly oblong, stalked, opposite, rarely alternate, $\frac{1}{2}$–2 inches long. Flowers solitary or three in the umbel. Operculum conical, half as long as the capsule. Fruit hemispheric to semi-ovate, $\frac{1}{4}$–$\frac{1}{3}$ inch diameter, on very short stalk. Capsule sunk.

On mountain tops, from La Perouse to Arrowsmith and to the West Coast. (*The Tasmanian Flora*, p. 58, 1903.)

It will be observed that while the type describes the flowers as 1–3, a form in which the flowers are solitary is fairly constant.

The leaves were originally described as alternate, but Rodway records them as flowering also in the opposite stage, adding another to the species recorded as flowering both in the opposite and alternate leaved stage.

RANGE.

It is confined to high lands in Tasmania, extending to no other State. The type comes from Mount Fatigue at 4,000 feet.

Mr. Rodway's statement is "On mountain tops from La Perouse to Arrowsmith and to the West Coast."

I have seen the following specimens:—

"Fatigue Hill (or Mount Fatigue), above 4,000 feet above the sea-level." (R. Gunn No. 1113.) This is the type.

"Mount Sorell, 3,000 feet, Macquarie Harbour, 1–3 feet high." (R. Gunn No. 1113.)

Mount La Perouse (L. Rodway); Cradle Mountains (G. Weindorfer).

AFFINITIES.

Bentham (B.Fl. iii, 232) says "It is in some respects nearly allied to *E. viminalis*, in others to *E. dumosa*."

1. With *E. viminalis* Labill.

This species is nearly allied to *E. Gunnii* Hook. f., and I think *E. vernicosa* is more closely allied to the latter than to *E. viminalis*. The broadish juvenile leaves at once separate it from *E. viminalis*.

2. With *E. dumosa* A. Cunn.

I do not see any close affinity. Plate 16, Part IV, may be compared. *E. dumosa* is an erect shrub or small tree usually found in regions of low rainfall, and relatively high temperature. The foliage is very different, as are also the anthers and flower-buds, both as regards the number, shape, and sculpture. The fruits of the two species have some superficial resemblance.

3. With *E. Gunnii* Hook. f.

Mueller could not unhesitatingly make up his mind to acknowledge *E. vernicosa*, and wrote but little about it.

He said "*E. vernicosa* may constitute merely a glacial-grown pigmy form of *E. Gunnii*" ("Eucalyptographia," under *E. cordata*).

The late Mr. Luehmann (Mueller's assistant) told me that Mueller had the species drawn, but finally decided not to publish it as he considered it a variety of *E. Gunnii*. See some additional remarks under *E. Muelleri*. He, however, inserted it in both his First and Second Censuses of Australian Plants.

I wrote in 1905 :—

"Mueller held the view, which he expressed to me verbally, that *E. vernicosa* is an extreme form of *E. Gunnii*, Hook. f. At the same time it is such an extreme form that I think it seems desirable to retain it as a species. *E. Muelleri* T. B. Moore, appears to be a connecting link between *E. vernicosa* and *E. Gunnii*." (*Proc. Linn. Soc. N.S.W.* xxx, 510.)

Mueller held the view that other forms, which are now looked upon as distinct, were also to be included in *E. Gunnii*, but there is no doubt that in considering the position of *E. vernicosa* he had in mind typical *E. Gunnii*, such as is figured in Part XXVII, Plate 108. The anthers of the two species are very similar, and there are some resemblances in the juvenile leaves, in the shape of the cruciform buds, and to a less extent in the fruits. In the larger growing plants of *E. vernicosa* the leaves are not very dissimilar to those of the broader-leaved forms of *E. Gunnii*, and the more the two species are studied, the more it will be found that the affinity is a real one.

It seems difficult, at first sight, to understand why Mueller should have ever doubted that *E. vernicosa* is worthy of specific rank; but we must bear in mind that recognising a specific name is a matter of opinion, and the amount of evidence that a man may require for the recognition of a species is dependent on psychological factors, and therefore may vary at different times. I know nothing more difficult sometimes than the apportionment of this evidence. During the writing of the present work I have arrived at conclusions which may modify the views I have published earlier in the same work as to the limitations of species, and indeed my opinions may again change in the direction of leaving things as they were.

4. With *E. Muelleri* T. B. Moore.

This is probably the geminate species of *E. vernicosa*, or perhaps a form of it, and some remarks will be offered when *E. Muelleri* is reached. See p. 160.

DESCRIPTION.

CXLVI. E. Muelleri T. B. Moore.

In *Papers and Proc. Roy. Soc. Tas.*, 207 (1886).

Branchlets spreading, cylindrical.

Leaves thick, alternate, shining and crenulated; lanceolate or ovate, often acuminate, oblique, rarely straight; veins indistinct, circumferential vein irregular, but generally close to edge of leaf, oil-glands pellucid.

Peduncles short, deltoid and flattened, each with two or three flowers.

Calyx-tube much less rounded and more angular than the fruit, about 3 lines long, with a similar diameter at its dilated orifice.

Operculum short, verrucous, with orbicular point.

Fruit hard, generally winged or angled twice, globose or ovoid, from 3 to 4 lines diameter, much dilated at the orifice, the rim rounded and slightly prominent, capsule sunk, but valves protruding when open.

It was not admitted by Mueller in his Census.

Mr. Moore adds :—

"Here, in a less exposed situation and at a much lower elevation, this magnificent tree rises to the stupendous height of 200 feet; and in many cases, for half that lofty distance its long straight stems are branchless, a most noticeable peculiarity in its growth. The bark is thin, smooth, and of a reddish or chocolate colour; but where the deciduous part is freshly shed, it is mottled with yellowish streaks or blotches. The wood is of a light red colour, extremely hard and surprisingly heavy, and is of a stringy and close-grained character." (*Op. cit.* p. 208.)

Mr. L. Rodway, in *Papers and Proc. Roy. Soc. Tas.*, 1894, p. 52, supplements the description in the following words :—

Mr. Moore's description, though very lucid, does not include all one would wish, I therefore take this opportunity to describe it more fully :—

Eucalyptus Muelleri T. B. Moore. A tree often attaining 200 feet. Bark scaly at the base, smooth above, glaucous, but becoming blotched with rufous green on prolonged exposure. Leaves alternate, petioled, slightly oblique, 3–5 inches long, ovate to narrow, lanceolate, acute, margin crenate, veins obscure, rather numerous and oblique. Peduncles axillary about ½ inch long, angled. Flowers sessile, normally three. Calyx in the mature bud obscurely angled, 4 lines long; operculum rather flat to subconical, verrucose and umbonate. Flowering calyx turbinate, 3 lines diameter. Stamens 2½ to 3 lines long, anther-cells parallel. Fruit broadly turbinate, slightly angled, 4 lines diameter; capsules deeply sunk, the valves just reaching the top of the rim.

In his "Tasmanian Flora," p. 58 (1903), he briefly describes it :—

E. Muelleri T. B. Moore. A very tall, erect tree, though sometimes flowering when still small. Bark smooth, blotched with red-brown. Leaves oblong-ovate to lanceolate-falcate, thick, shining, stalked, alternate, 1–3 inches long. Flowere three in the umbel, nearly sessile in the axils. Operculum nearly flat, umbonate, rough. Fruit turbinate, ⅛–½ inch. Capsule sunk. Valves often protruding.

Common on mountains in South-west Tasmania at about 2,000 feet altitude. Very probably a lowland form of *E. vernicosa* H.

RANGE.

It is confined to Tasmania.

The type came from "a saddle of the Dividing Range between the Huon and Derwent watersheds, on bleak high land at an elevation of over 2,000 feet."

Rodway defines its range as common on mountains on south-west Tasmania at an elevation of about 2,000 feet.

Extensively dispersed round the southern slope of Mt. Wellington, at about 2,000 feet elevation, where it can be seen in quantity in the region of the Springs Track to the Two Bridges and Forked Creek Rivulets, where it forms the principal timber. (L. Rodway, 1894, p. 51.)

Mr. R. H. Cambage and I have collected it at the Springs, where we saw trees at least 80 feet high.

I collected it at Mount Field East at an elevation of 4,000 feet in March, 1906, and have the note "*E. Muelleri*, a form showing transit to *E. vernicosa*." Compare Mueller's notes at p. 159.

AFFINITIES.

1. With *E. vernicosa* Hook. f.

Some notes on the affinities of these two species have already been made. See p. 159.

In *Proc. Roy. Soc. Tas.*, 209 (1886), Mueller makes the following comments on *E. vernicosa* and on the tree proposed, on the same occasion, to be named *E. Muelleri*.

He stated that a plate of *E. vernicosa* had been lithographed, but withheld from publication, as it seemed likely that, in its very dwarf state, it represented the highland form of a taller plant of sub-alpine regions.

He then gave an account of a tree found by him in 1869 at Mount Field East which, at between 3,000 and 4,000 feet, reached a height of 30 feet, "and which seemed to me rather a tall state of *vernicosa* than a variety of *E. Gunnii*." I collected the same plant at the same spot many years after (J.H.M.).

He goes on to say that "from the above remarks it will be perceived that the plant from near the Lakes of Mount Field offers some approach to *E. urnigera*; this is borne out by specimens of evidently the same tree just submitted to me by Mr. T. B. Moore, as obtained by him during recent surveys across the Mount Wellington Ranges."

. . . . . "It remains now to be shown in what precise position systematically *E. vernicosa* is standing to *E. urnigera* and to *E. Gunnii*, after this most highly developed state of the former (presumably *vernicosa* is meant.—J.H.M became discovered."

Later on, Rodway observes :—

It remains still a matter of opinion whether the tree should be considered specifically distinct from *E. vernicosa* H. Its close relationship is undeniable, but the fact that this tree appears to die out at a sub-alpine altitude, and the dwarf alpine *E. vernicosa* not appearing in localities where this is so common, would lend some weight in support of the trifling structural differences. Beyond the greater dimension of the tree the leaf is more oblique, longer proportionately, and the veins more regular and less oblique than in *E. vernicosa*, and the calyx and capsule are larger. But these differences are not more than could be reasonably expected from the greater vigour.

The wood is of a pale red colour, and rather heavy; of a close fibrous texture of great tenacity, and is commonly used for palings and shingles, but it makes excellent axe-handles, and would be very useful for all purposes where considerable strength and toughness were required. (L. Rodway, *Proc. Roy. Soc. Tas.*, 1894, p. 51.)

The same botanist subsequently says :—

Here (Mt. Geikie, West Coast) also occurs a small form of *E. Muelleri* T. B. Moore; only 15–20 feet high, which though very similar in general appearance to *E. vernicosa*, still maintains its distinctness in its crenulated leaves with less oblique venation and flattened operculum. (L. Rodway, *Proc. Roy. Soc. Tas.*, 1898–9, p. 104.)

Rodway's latest published judgment, in his "Tasmanian Flora," p. 58 (1903), is "Very probably a lowland form of *E. vernicosa* Hook. f."

I have already, p. 159, pointed out how difficult it is sometimes to make up one's mind as to the limitation of a species, and consideration of such limitation can be very usefully studied in connection with *E. vernicosa* and *E. Muelleri*. Mr. Rodway has put the case for and against *E. Muelleri* being a variety of *E. vernicosa* very fairly.

I have come to the conclusion that, on the whole, it is desirable that *E. Muelleri* should be recognised as a distinct species.

The facts that the leaves of *E. vernicosa* are varnished, those of *E. Muelleri* being much less so, and that the former species is a small (never very large) shrub, while *E. Muelleri* attains the size of a large timber tree, have some value.

Now let us compare the figures on Plate 116. The juvenile foliage of *E. vernicosa* is unknown; that of *E. Muelleri* is shown at 5a and 6a. The mature leaves of *E. vernicosa* are small, nearly as broad as long, and shortly petiolate; those of *E. Muelleri* are much larger, long in proportion to their width, and have long petioles. The anthers are nearly the same, the buds of *E. Muelleri* are much more angled, sometimes winged. It is in the fruits that the two species differ greatly, those of *E. vernicosa* being campanulate, with a thinnish rim and the valves sunk; those of *E. Muelleri* are nearly hemispherical, coarsely angled, and with broad rims.

2. With *E. urnigera* Hook. f.

It grows with and is very like *E. urnigera*, Hook. f., with which I have no doubt it has been confounded. The two trees can hardly be distinguished when seen together, and with *E. Muelleri* the branches are very tough, so that it is most unusual to pick up broken limbs with inflorescence. With *E. urnigera* on the contrary, the wood is brittle. (L. Rodway, *Proc. Roy. Soc. Tas.*, 1894, p. 51.)

Compare Part XVIII, Plate 80, of the present work. There is a general similarity between both juvenile and mature leaves of both species—certainly sufficient to put one on one's guard. The anthers are not very dissimilar, but the buds and fruits are sharply dissimilar.

3. With *E. coccifera* Hook. f.

. . . . . (the) buds and fruit (of *E. Muelleri*) are practically similar to those of *E. coccifera*, and till one was fortunate enough to secure flowers and detect the parallel anther-cells, the distinctness would not suggest itself. (L. Rodway, 1894, p. 51.)

Compare with Part V, Plate 28, of the present work. There is a general similarity in the mature leaves, the veins of *E. coccifera*, however, form a more acute angle with the midrib; they also have hooked tips. The juvenile leaves of *E. coccifera* are sufficiently different from those of *E. Muelleri*. The anthers are, as Mr. Rodway has pointed out, quite different. I do not agree that the buds and fruit of *E. coccifera* are similar to those of *E. Muelleri*, unless there is a much greater amount of variety in the buds and fruits of *E. coccifera* than I have depicted.

In Plate 28 the buds are in more than threes and appear quite different, while the fruits have no exserted valves, and differ in other respects.

I may point out that the lettering of some of the figures on Plate 28 is not correct. 2a and 2b belong to *E. coccifera*, as well as 3, 4, and 5.

4. With *E. ovata* Labill.

The resemblance to *E. ovata* is quite sufficient to be noticed. Compare Part XXVII, Plate 114. It is most noticeable in the larger fruited forms, see figure 2 of that Plate (my suggested var. *grandiflora*). The anthers and mature foliage resemble each other, the juvenile foliage less so. The fruits of *E. ovata* are in more than three, more pedicellate, and more top-shaped and less angled.

5. With *E. alpina* Lindl.

There is a superficial resemblance between these two species. They have coriaceous foliage, almost greasy in lustre, rugose buds, and fruits which though smaller in *E. Muelleri*, have some resemblance. *E. Muelleri* may be a large tree; *E. alpina* is always a scrambling small tree, with reniform (though not typical) anthers.

DESCRIPTION.

CXLVII. E. Kitsoniana (J. G. Luehmann) Maiden.

As *E. Kitsoni* in *Victorian Naturalist* xxi, 112 (1904).

FOLLOWING is the original description :—

Eucalyptus Kitsoni, J. G. Luehmann, Herb.*

This species-name has already found its way into literature, but the species has not been described, through the unfortunate illness of my friend Mr. J. G. Luehmann, F.L.S., Curator of the National Herbarium, Melbourne. One reference is in the *Victorian Naturalist*,† and the plant has also been distributed by Mr. Luehmann under the name above given.

A dwarf tree. It usually does not grow higher than 4 feet to 5 feet, but at Foster it is found 18 to 20 feet in height. (A. W. Howitt.)‡ Mr. Howitt informed me that it attained a height of 30 feet.

Bark.—Smooth in texture and ashy-grey in colour, which becomes lighter in the upper branches. (A. W. Howitt, *op. cit.*)

Juvenile Foliage.—The youngest specimens seen by me are oblong to broadly lanceolar in shape, sessile, or with a very short petiole, rounded at the apex, or terminating in a blunt point, symmetrical; texture coriaceous. The dimensions of some specimens are 3 x 1¾ inches and 5 x 2¼ inches. Veins well marked, spreading, the intramarginal vein a considerable distance from the edge.

Mature Foliage.—When in a flowering state this tree has sometimes a few oblong leaves, but they vary in all degrees of width of lanceolar shape up to, say, 4 inches long by half an inch wide. Leaves on flowering twigs may be a little different from the juvenile foliage stage, either as regards shape or position of intramarginal vein. Fully developed leaves have the intramarginal vein close to the edge, and are petiolar, with a petiole of an inch and more.

Buds with blunt conoid operculum when unripe, the calyx sessile on a broad (strap-shaped) peduncle. When near bursting the operculum is either perfectly hemispherical or with a slight umbo.

Flowers.—In a head of usually seven individual flowers, but they may be as few as three. Anthers two-celled and parallel.

Fruits.—Hemispherical to sub-cylindrical in shape, or more or less conoid by mutual pressure. Over ¼ inch in diameter. The rim truncate and well-marked, the tips of the valves flush with the rim, or scarcely exceeding the rim. The fruit smooth or slightly angled. Valves in 3's, 4's, and 5's as seen.

Species-name in honour of Albert Ernest Kitson, F.G.S., geological surveyor in the service of the Victorian Government, who has, at the instigation of Mr. Howitt, given much attention to this eucalypt.

Mr. Frederick Chapman, of the National Museum, Melbourne, obligingly points out that the name *Eucalyptus Kitsoni* is preoccupied by Mr. Henry Deane (*Rec. Geol. Surv. Vict.*, Vol. i, pt. i, p. 25, pl. iv, figs. 5–7) for a fossil species from Berwick, Victoria. I, therefore, suggest alteration to *Kitsoniana*.

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* As the above description was my own, I received a good deal of friendly criticism at the time through the absence of my name. I now conjoin my name with that of the late Mr. Luehmann.

† Vol. xvii, p. 81 (6th September, 1901). ‡ *Trans. Roy. Soc. Vict.*, 1890, p. 101 ■ *E. Gunnii* [*b*]).

SYNONYM.

E. Gunnii var. (*b*), Howitt.

This dwarf variety grows in poor, boggy country in the low-lying tracts, but also occurs in the drier hills at Foster. It usually does not grow higher than 4 feet to 5 feet, but at Foster it is found from 18 feet to 20 feet in height. The bark is smooth in texture, and ashy-grey in colour, which becomes lighter in the upper branches. Generally, when in its dwarf form it has a large butt level with the ground of several feet in diameter, from which rise numerous shoots.

In the dwarf form the leaves (excepting in the upper shoots) are somewhat broadly ovate, and are opposed and sessile. The texture is thick and leathery, of a dull, rather dark green colour. In the taller examples the leaves become scattered, ovate lanceolar, somewhat attenuated at the stalk, and acuminate. They are equilateral, slightly shining, and of a rather brighter tint than the sessile leaves, and have the marginal vein distinctly removed, the lateral veins numerous and rather spreading. Very often the terminal leaves are opposed.

This Eucalypt flowers and fruits when in a completely dwarf state. The umbels are mostly axillary, and of a bright yellow to orange colour, as are also the stalks and young shoots. The stalklet is angular and wrinkled, sometimes rounded, about twice as long as the sessile buds, which are 3 to 7, and much crowded together. The fruit sessile in clusters of 3 to 7, semi-ovate, margin slightly compressed, valves small, not exserted, stalk slightly flattened. (A. W. Howitt, *op. cit.*, p. 101.)

RANGE.

"Dwarf eucalypt, Foster, Gippsland, Victoria; A. W. Howitt, 14th November, 1888" (label on specimens in Nat. Herb. Melb.; comm. J. G. Luehmann).

"Grows in poor, boggy country, in the low-lying tracts, but also occurs in the drier hills at Foster" (A. W. Howitt, *op. cit.*).

"All the undoubted samples of the species that I have yet seen on these (Powlett) plains are from burnt boles, though I believe some I saw nearer Cape Patterson are seedlings" (A. E. Kitson, 3rd February, 1903, in litt.). Foster is further to the east.

AFFINITIES.

1. With *E. botryoides* Sm.

Let us compare *E. Kitsoniana* with Victorian-grown *botryoides*. The juvenile foliage is smaller, much thinner, more acuminate, and has the venation more transverse, and the intramarginal vein closer to the edge in *E. botryoides*, while the mature foliage is certainly more transverse-veined. I have never seen the buds of *E. botryoides* so rounded as in *E. Kitsoniana*. The fruits of *botryoides* are more cylindrical, and the valves more sunk within the orifice. The bark of *E. botryoides* is fibrous scaly. I regret I have not been able to obtain a piece of timber.

2. With *E. ovata* Labill. (This is one of the species included in *E. Gunnii* Hook. f., by Mueller).

E. Kitsoniana is the var. (*b*) of *E. Gunnii* of Howitt, see p. 165, so Mr. Howitt informed me.

E. ovata is common in sour, swampy land in Southern Victoria. It has the juvenile leaves more rounded and the opercula more conical. The fruits also are more top-shaped than those of *E. Kitsoniana*, and the rim broader than the rest of the calyx. The peduncles are not strap-shaped, while the buds, flowers, and fruits are pedicellate.

3. With *E. dumosa,* var. *rhodophloia* Benth. (*E. incrassata* Labill., var.).

It is certainly very near to the above, and perhaps identical with it. See B.Fl. iii, 230, and the present work, Part IV, p. 98. I have drawings only of the Kew specimens examined by Bentham. They are from Phillips's Bluff, near Eyre's Relief, W.A., but, as compared with *E. Kitsoniana*, show some of the fruits slightly pedicellate, with, however, sessile buds. The peduncles are strap-shaped. The fruits are in 3's and 4's (those of *E. Kitsoniana* being in 3's, 4's, and 5's). The foliage appears to be identical as far as it goes.

But all the differences enumerated may not amount to much, and, considering the *E. Kitsoniana* and the *rhodophloia* specimens are from localities separated by two thousand miles, it would be extraordinary if they were precisely identical.

DESCRIPTION.

CXLVIII. E. viminalis Labillardière.

Nov. Holl. Pl. ii, 12, with plate 151 (1806).

FOLLOWING is the original :—

"Eucalyptus operculo subhemisphærico, mucronato; foliis lineari-lanceolatis; capitulis trifloris, lateralibus. Arbor mediocris altitudine, ramulis apice angulosis. Folia lineari-lanceolata acuminata, nervulis vix conspicuis, palmaria ad spithamea; petiolata, alterna. Flores communi pedunculo axillari, subancipiti, vix petiolorum longitudine, saepius tres cruciatim dispositi, centralis pedicello longiori cæterorum. Calyx semi-globosus, operculo paululum eodem breviori, coriaceo. Stylus brevior, staminibus, stigmate subcapitato. Capsula globosa, calyce corticata, semitecta, tri ad quadrilocularis. Alias ut in specie præcedenti. Habitat in capite Van-Diemen."

The descriptions in English in the *Flora Australiensis* and *Eucalyptographia* can be accepted as correct, and there is an excellent figure in the latter work, but the synonymy quoted by Bentham and copied by Mueller is considerably incorrect as will be shown presently, and also under "Synonyms." The cause of the trouble has been too great reliance on dried, imperfect specimens. Those of us who have come later have had opportunities of studying the various forms in the field.

I will quote and briefly discuss a number of references to this species in works chiefly quoted by Bentham in *B.Fl.* iii, 239 :—

1 and 2. Neither Sprengel, *Systema Vegetabilium* ii, 501 (1825) (not 505 as quoted in "Eucalyptographia") nor *DC. Prod.* iii, 218, both brief Latin descriptions, add anything to Labillardière.

3. Hook. f. *Fl. Tasm.* i, 134. It is not figured in this work, but Gunn's 685, 1083, 1085, 1090, 1092, are quoted.

Hooker speaks of it as abundant throughout Tasmania, ascending to 4,000 feet and forming "a middling-sized tree 60 feet high."

The peduncles "bear three, rarely four or more flowers . . . Australian specimens have often more than three flowers on each peduncle."

4. Miq. in *Ned. Kruidk. Arch.* iv, 125; (see *E. saccharifera* F.v.M. below).

5. F. Muell. *Fragm.* ii, 64, is a recapitulatory account of the species.

Howitt says (*Trans. Roy. Soc. Vict.* ii, 97, 1890), "My observation has shown me that there are at least three Eucalypts which may be assigned to the type of *E. viminalis*." He goes on to say :—

(*a*) The typical form of *E. viminalis* in Gippsland is the so-called "white gum," or "river gum," which grows along the immediate courses of streams. It may, for instance, be seen along the Glengarry, Thompson, Mitchell, and other rivers.

It accords well with the description of the species given in the "Eucalyptographia," hence I need not refer to it further here, more especially as I shall have to draw attention to it in distinguishing the varieties.

The typical form grows from near sea-level to at least 4,000 feet, as on some small streams rising in Mount Livingstone. It is especially found following the river courses, and ascends to its highest elevation without extending to the hills on either side. (See Pl. 15, Figs. 23 to 31; Pl. 14, Figs. 7, 8, 9.)

Size.—Mueller ("Eucalyptographia") quotes a Victorian tree up to 320 feet high and with a diameter of 17 feet, and another of 20 feet, but in view of the shrinkage which has taken place in the reputed heights of *E. regnans* from the same districts, when taken in hand by a surveyor, I recommend that authoritative measurements be sought for. At the same time the species attains a very great height; I have personally seen enormous trees.

Bark.—Rodway, speaking of Tasmania, where the type came from, says ("The Tasmanian Flora," p. 57), "Bark usually smooth and white from the base, but sometimes the trunk coarsely scaly or scaly-fibrous even to the upper branches."

With a rough persistent bark, at least on the trunk and main branches, that of the smaller branches often smooth and deciduous, and sometimes the whole described as deciduous. . . . In New South Wales specimens the bark sometimes said to be quite smooth, probably when the rough bark has been shed. (B.Fl. iii, 239, 240.)

Bark much persistent on the stem and sometimes also on the main branches, outside rather dark-coloured, wrinkled and rough, comparatively solid in texture, though somewhat fragile; through secession leaving the younger bark outside smooth and whitish-grey or almost white, giving off externally when rubbed, a flour-like bloom, as does also the bark of *E. redunca*. (*Eucalyptographia.*)

The late C. Walter speaks of "A coast form with rough bark, Port Phillip."

In New South Wales, most generally the bark is smooth, deciduous, hanging in strips. It is what we know as a "Ribbony Gum." The ribbons are best seen on wet, windy days; they then flatten out and are seen to be of great length, like streamers or pennants.

Notes on the anatomy of the bark of this species by Professor Moeller of Vienna, will be seen in the "Eucalyptographia."

Seedling leaves.—Usually they are narrow, but they vary a great deal in size and texture, becoming almost coriaceous in some specimens. As regards the breadth of seedling leaves, we take a few instances almost at random.

(*a*) Narrow and broadish; multiflowered. (A. W. Howitt, Wando Vale, Vic.)

(*b*) Broadish; in threes. (Sunny Corner, N.S.W., J. L. Boorman.)

(*c*) The broadening of the seedling foliage is very common in northern New South Wales, and Mr. L. Rodway informs us that broadish seedling leaves are common in Tasmania in this species also.

Broadish juvenile leaves are figured at Fig. 3a, Plate 118, and Figs. 1a, 1b, 1c, 2, 11a, 11b, Plate 119.

It must, however, be understood by the term "broadish" that it is comparative as regards the usual narrow juvenile leaves of *E. viminalis*, and that it is far from approximating to broad suckers, *i.e.*, those in which length and breadth tend to become equal. At the same time I admit that occasionally, *e.g.*, Fig. 1b of Plate 119, the juvenile leaves are fairly described by the adjective broadish.

Mature leaves.—The strictly opposite character of the seedling leaves sometimes extends even to the mature foliage (*e.g.*, figs. 12a and 13 of Plate 118), and may extend to even above the fruits (*e.g.*, certain trans-Blue Mountains specimens).

The foliage has a dainty fragrance, not easily described.

Pedicels.—Pedicels short (B.Fl. iii, 239). They, however, vary in length in many localities.

Buds.—In New South Wales specimens the buds are usually very smooth and shining (B.Fl. iii, 240). The words "smooth and shining" apply best to the buds of certain forms of *E. Gunnii* that Bentham included under *viminalis*, but shininess is no absolute criterion.

Operculum.—"Conical or hemispherical, blunt or sharp, as long as the calyx" (Hooker's Fl. Tas.). Obtuse or conical, not much longer than the calyx-tube. The shape varies within very wide limits. The ovoid-budded forms have the opercula rounded, sometimes nearly hemispherical; others are conical and even beaked. In northern New South Wales, for example, the operculum varies from ovoid to very pointed; this latter form is found in the northern portion and in Victoria and Tasmania. The beaked operculum is found in the three-flowered and multiflowered series.

Following are notes on two specimens with beaked or very long opercula :—

(*a*) A specimen from Snowy River in Herb. Melb. in Mueller's handwriting, "*E. viminalis* Labill. var. *pedicellaris* Mueller." Slightly glaucous; multiflowered.

(*b*) Also from the Snowy River, labelled by Mueller "*E. viminalis* Labill., var. *rhynchocorys*, Ferd. Mueller (*rhynchos*, a beak) and with the addition, "regarded by Bentham as a variety of *E. tereticornis*" (a mistake readily made with specimens only in leaf and bud). Three-flowered; slightly glaucous.

E. viminalis often multiflowered.

"Peduncles . . . . bearing three, rarely four or more flowers ; ; ; ; Australian specimens have often more than three flowers on each peduncle" (Hooker's Fl. Tas.). We have a number of multiflowered specimens from Tasmania.

"Peduncles short, axillary or lateral, bearing in some specimens, especially northern ones, always 3 flowers on short pedicels, in others 6 to 8 flowers more distinctly pedicellate." (B.Fl. iii, 239.)

" The species varies very much in the size and number of the flowers, and the shape of the operculum. In the original Tasmanian form, common also in Victoria, the peduncles are mostly 3-flowered, although occasionally many-flowered specimens occur." (*Ib.*, p. 240.)

Howitt's " typical form of *E. viminalis* " (Eucalypts of Gippsland, *Trans. R. Soc. Vict.* ii, Part i, p. 97, pl. 15, figs. 23–31), includes a form with 5 flowers.

" Umbels generally three-flowered " (Mueller, " Eucalyptographia ").

" *E. viminalis* rarius 4–7 floris " (Fragm. ii, 64).

At Lidsdale, New South Wales, we found trees of the true " Manna, or Weeping White Gum," flowers mostly in threes, but up to 7's; and in the Kanimbla Valley (road to Lowther) with flowers in 4's.

We have often amused ourselves in searching for 4's and even for 5's in trees that appeared to have the inflorescence entirely in 3's, and usually found them, if sufficient patience were exercised.

It is often convenient in practice to divide the species into those which have the flowers in threes and those which have them in more than three. We have multiflowered specimens from every State in which the species is found.

E. viminalis has been sent to me with crimson filaments from Mount Wilson by Mr. Jesse Gregson.

Fruits.—" Fruit-rim not very convex and often flat. In the New South Wales specimens the flowers and fruits are usually small." (B.Fl. iii, 240.) The size and shape of the fruits vary a good deal. We have some quite small ones from Tasmania, and the largest ones we have ever seen are from northern New South Wales. From that part of the State we have also obtained some smaller than the average, and some with valves protruding further than we have seen them from any other locality. Sometimes they are nearly hemispherical; others are longer in proportion to the width.

E. viminalis, is known as the Manna Gum because of the manna it exudes from the leaves. It seems more appropriate to discuss the subject of manna in my " Forest Flora of New South Wales." In New South Wales at least *E. rubida* yields manna more abundantly than does *E. viminalis*.

SYNONYMS.

It will be seen what confusion has gathered around *E. viminalis*. We have few true synonyms, but a comparatively large number of reputed synonyms. The true synonyms would appear to be :—

1. *E. angustifolia* Desf.
2. *E. saccharifera* F.v.M.
3. *E. crucivalvis* F.v.M.

The reputed synonyms are :—

1. *E. diversifolia* Benth. non Bonpl.
2. *E. elata* Dehn. (?).
3. *E. persicifolia* Lodd. non DC.
4. *E. pilularis* DC. non Sm.
5. *E. Huberiana* Naudin (?).

References will be given to the above names in sequence together with additional notes on Bentham's synonymy.

1. *E. angustifolia* Desf. (quoted also as Spreng., et Candolle, and Link Enum; ex. Spreng.). The original is :—" angustifolia, à feuill. étroites, N. Holl., or." (Desf. *Tabl. Ecol. Bot.* Ed. 1, 1804, p. 222.)

Then we have :—

" 227 E. angustifolia, Desfont. Par. Fol. subsessilia 2′ 6″ lga., 2″ lata acutata attenuata " (Link, *Enum. Hort. Berol.* ii, 30). Sprengel ii, 501, makes it a synonym of *E. saligna* Sm.

It is *E. viminalis* Labill. according to a specimen in Hort. Berol. examined by me in 1900.

The name *E. angustifolia* is preoccupied in any case, and the present synonym is not important. But it is desirable to set down the evidence in regard to these old names.

2 and 3. *E. saccharifera* F.v.M. and *E. crucivalvis* F.v.M. Following is an extract from Miquel in *Kruidk. Arch.* iv, 125 :—

E. viminalis, Labill. *l.c.* p. 12, Tab. 151, DC. Prod. *l.c.* 218, n. 15.

E. saccharifera, Ferd. Müller mss.

E. crucivalvis ej. olim.

"In humidis ad Onkaparinga m. Aug. Beagle Range, Lofty Range (F. Müller). Tasmania (Stuart n. 7). Arbor procera, trunco cinereo albo recto."

I have seen one of Miquel's specimens as above in Plantæ Müllerianæ (Herb. Barbey Boissier), and it is *E. viminalis*. There is a specimen, similarly labelled from Herb. W. Sonder in herb. Cant. ex. herb. Lindl.

I have seen specimens of *E. saccharifera* and *E. crucivalvis* so labelled by Mueller (the latter having very exserted valves).

Incidentally I may remark that *saccharifera* was sometimes written *saccharifiua*. Two specimens are before me as I write, viz., one in Miquel's handwriting, and a second in W. H. Harvey's handwriting "ex herb. Hook." circa 1855. We may, therefore, with safety put *saccharifera*, *saccharifiua*, and *crucivalvis* as synonyms of *viminalis*.

Reputed Synonyms.

1. See the following references in the *Flora Australiensis* under *E. viminalis* :—

"*E. diversifolia* Bonpl. *Pl. Malm.* 35, t. 13; DC. *Prod.* iii, 220.

"Kangaroo Island *R. Brown*, *Waterhouse*, these specimens precisely agreeing with those of *E. diversifolia* from French gardens, originally raised from Kangaroo Island seeds. . . ."

"In the South Australian *E. diversifolia*, the flowers are rather numerous in the umbel, and the fruit large."

See Vol. I, p. 200, of the present work. The specimens are not *E. viminalis;* they are *E. diversifolia* Bonpl.

Bentham goes on to say :—"*E. fabrorum*, Schlecht., in Linnæa, xx, 656, was supposed by F. Mueller to refer to *E. obliqua*, owing to his stating it to be the 'Stringy-bark' of the colonists, but Behr's specimen in Herb. Sonder, communicated by Schlechtendahl, is evidently the large-fruited form of *E. viminalis*." Bentham's reference is to *E. diversifolia* Bonpl. See Vol. I, pp. 40, 203, 218, of the present work.

2. *E. elata* Dehnhardt." This is also quoted as a synonym. See *Catalogus plant. Hort. Camuld.* 26.

According to Mueller ("Eucalyptographia"), this is referable to *E. amygdalina* and not to *E. viminalis*, according to a specimen received from Baron Cesati, see *Nuovo Gornale Bot. Ital.* xii, 46. See Part VI, p. 157 of the present work, where I suggest it may be rather *E. radiata* Sieb. (*E. numerosa*, Maiden), closely allied to *E. amygdalina*. The original description of the leaves is "lineari–lanceolatis . . . . pellucido–punctatis." Another specimen labelled *E. elata* Dehn. ex. h. (hort.) bot. Berolin. in Mueller's handwriting, given to me by Mr. Luehmann, is *E. globulus* Labill. Obviously two, if not three, species are included in specimens sent out as *E. elata* Dehn.

2*a*. "Walp. *Rep.* ii, 163." The reference is to *E. elata* Dehn., just dealt with, and to *E. mannifera* Moudie (Moodie), see below.

2*b*. "*E. mannifera.* A Cunn., and perhaps also Moodie; Walp. *Rep.* ii, 163, although incorrectly described. This is *E. rubida* Deane and Maiden. See Part XXVI, p. 110.

3. "*E. persicifolia* Lodd. *Bot. Cab.* t. 501 (from the fig.), not of DC." See Vol. I of the present work, pp. 31, 33.

4. "*E. pilularis,* DC. *Prod.* iii, 218, not of Sm."

The following are based on Bentham's references :—

a. "*E. granularis,* Sieb. Pl. Exs." This is *E. rubida* Deane and Maiden. See Part XXVI, p. 110.

b. "*E. Gunnii,* Miq. in *Ned. Kruidk. Arch.* iv, 126 (not of Hook. f.), from Streleczky range, Victoria, appears to be *E. viminalis.*"

This is *E. rubida* Deane and Maiden. See Part XXVI, p. 110.

c. "*E. patentiflora,* F. Muell., is referred here in F. Muell. *Fragm.*, ii, 64. The specimens described under that name by Miq., in *Ned. Kruidk. Arch.* iv, 125, belong to *E. melliodora.*"

See Vol. II, p. 136, of the present work.

d. "Exhibition Woods, No. 108, *Macarthur,*" quoted by Bentham as a synonym, is the Flooded Gum of Camden, a tall tree, "a fine-looking, but comparatively worthless sort; the timber weak and not durable." (Cat. N.S.W. Timbers London Exh. 1862, p. 26, collected by Sir William Macarthur.) It is *E. Benthami* Maiden and Cambage, *Proc. Roy. Soc. N.S.W.* xlviii, 418 (1914).

5. *E. Huberiana* Naudin, *2nd Mem.* p. 42.

Described from one tree obtained at Nice, where it was cultivated by M. Huber, after whom it is named. It is allied to or identical with *E. viminalis.*

The leaves are short for *E. viminalis.* The following translation is published for the first time :—

I only know this species by a single specimen growing at the Villa Thuret, which I discovered at Nice in an old garden belonging to M. Huber, a horticulturist, after whom I named it. It is biform and quite distinct from all those that I know. The young leaves are opposite, sessile, oval or oval-oblong, pointed, cordiform, and united at the base, slightly glaucescent, 3–4 *centimetres long and* 7–10 *millimetres broad at the most;* when the tree is full grown the leaves are alternate, petiolate, narrow-lanceolate, pointed at the apex and the base, straight or very slightly curved, of a bright green colour, 12–16 centimetres long and 7–10 millimetres broad at the most. From a distance, and at the first glance, one might take *E. Huberiana* for a rather slender form of *viminalis,* but it can be easily distinguished from it by the following characteristics.

Its inflorescence consists of axillary umbels, rather shortly pedunculate, composed of seven very small pedicellate flowers with the conical operculum the same length as the calyx tube. The fruit which is about as large as an average grain of hemp-seed is pyriform-truncate. The capsule is three-celled, flat on top and a little shorter than the calyx tube, the erect valves however exceed it slightly when mature.

This Eucalyptus is a graceful tree, slender of form, rustic in this country, about 10 metres high when 7 years old, but I do not know to what height it might attain in time, or to what part of Australia it is native.

RANGE.

Mueller ("Eucalyptographia") gives the range as Spencer's Gulf (South Australia), also Kangaroo Island to Gippsland, thence to Tasmania and New South Wales (north to New England and west to Lachlan River). I doubt if it goes as far west as the Lachlan. In Tasmania, the home of the type, it is found all over the island.

It loves the banks of streams or fresh-water lakes. It is partial to good, deep soil, when it attains a large size. It is, however, tolerant as regards soil, and is found on the side of hills, but it never attains the same development as when plenty of moisture is available.

TASMANIA.

It is common in most parts of the island.

Following are some classical specimens I have examined—

1. Robert Brown, Tasmania, 1802-5. No. 4740. River Derwent.
   Ditto No. 42.

2. No. 685, R. Gunn. Quoted by Hooker. Collected at Hobart, 29th February, 1840, also Hobart (Degraves), Risdon, River Side, also Woolnorth, Bevley Bank, Government Paddock, Hobart, and Circular Head. No. 685 was therefore not collected from one locality.

The truncate appearance of unripe fruits is observable in *E. viminalis* around Hobart.

The leaves vary a good deal in width in Tasmania itself. Operculum sometimes *very pointed.* Precisely similar to Victorian specimens from the Snowy River. See p. 169.

3. 1083, R. Gunn. Quoted by Hooker. Variously obtained from Marlborough (J. D. Hooker, 1840), and Lake Arthur (Gunn, 1843).

4. 1085, R. Gunn. Quoted by Hooker, Hobart. In bud, flower and early fruit. Government Paddock, Hobart.

5. 1086, R. Gunn. Government Paddock, Hobart, 1842. Bud and fruit.

6. 1087, R. Gunn. In bud and very young fruit. No precise locality.

7. 1090, R. Gunn. Quoted by Hooker. Circular Head, V.D.L., and Circular Head sandhills. In plump bud, flower and fruit. In various herbaria including herb. Sydney. Flowering profusely.

8. 1092, R. Gunn. Quoted by Hooker, Grass-tree Hill, V.D.L., Herb. Cant. ex. herb. Lindl. In bud only. Also Risdon, River Side. In bud and fruit.

9. 1097, R. Gunn. Fruits only (Plenty Bridge).

A number of Gunn's specimens (and probably Hook. f.'s as well) were distributed from the Hookerian herbarium under the name *E. viminea*, Lab., a slip of the pen for *E. viminalis.*

I have also examined :—

(*a*) A specimen ex. herb. Paris in herb. Barbey-Boissier, bearing the No. 127, collected in 1844 (probably by Verreaux, has the rather narrow leaves, and is similar in every other respect to Labillardière's figure of the type). This species is somewhat variable in the width of the leaves.

(*b*) No. 286, Oldfield, Hills, Frogmore, near Richmond, Tas. Herb. Barbey-Boissier, and Cant.

Other specimens in the National Herbarium, Sydney, are, Hobart (G. Caley, November, 1805); Mount Wellington (R. H. Cambage and J. H. Maiden); Bellerive, Hobart (L. Rodway).

Bark deciduous, almost from the extreme base, and almost silvery white when fresh. Tree small (30–50 feet), spreading. Wood yellow, brittle, worthless. A common Hobart form (L. Rodway).

Foot of Cumming's Head; Hills, plains, and sides of mountains near Deloraine; Hummocks.—(All W. H. Archer).

South Australia.

In this State it has only been recorded, so far, from the Mount Lofty Range and the Mount Gambier district.

E. "*crucivalvis* Mueller" (in his handwriting), "*E. saccharifera*, F. Müll." (in Miquel's handwriting), "Lofty Ranges" (Mueller). "Rough bark, clean branches," Mount Lofty (Dr. J. B. Cleland).

"A tall straight tree with a grey deciduous bark," Aldgate (Max Koch, No. 954).

Typical *viminalis* but fruits in 3's and 4's and 5's. Sucker leaves, mature leaves, old and young fruits, also from Narracoota Caves Forest Reserve (W. Gill).

Usually in threes, but also exhibiting a head of six; young fruits truncate; fruit valves of ripe fruits well exserted and typical *viminalis;* no sucker leaves available. Mount Gambier (W. Gill).

Victoria.

It is common in the moister, cooler districts of this State.

A specimen labelled "Australia felix," from Mueller in Herb. Cant., ex herb. Lindl., has a cluster of 4 fruits.

Domain, Melbourne, Wild tree. Many leaves opposite, not sucker foliage, but top of an adult tree (J. G. Luehmann). Cheltenham, Port Phillip (C. Walter); Little River, multiflowered (Fullagar); Barwon (J. Bracebridge Wilson).

Bark on trunk and branches very rough, not deciduous, timber white, 10–30 feet, Forest, Wando Vale (J. G. Robertson, No. 499, 14th January, 1844). "Weeping Gum," Red timber, Wando Vale (J. G. Robertson, No. 242, 7th April, 1842). Heath around Portland Bay, 10–20 feet (J. G. Robertson, 20th March, 1843). Port Fairy (J. H. Maiden); Hawkesdale (H. B. Williamson);

The following specimens from A. W. Howitt all have fruits in threes :—Geelong; Beaumaris; Glen Iris; Bruthen Creek; Port Albert, small trees on heaths, half-barked, smooth limbs; Alberton; Black Range, near Glenelg River. " In flats, bark rugged up to small limbs." No. 1 multiflowered.

There is a " Blackbutt " from Hotspur. Height up to 110 feet (measured tree). Wild Horse Creeks, fruits in 5's, pointed buds (A. W. Howitt).

Multiflowered, Turnback, Gippsland (A. W. Howitt); Hobson's Creek, Gippsland (Mueller); Swan Reach, South Gippsland (J.H.M.); Wilson's Promonotory (J. Blackburne); Healesville (C. Walter); foot of Mount Macedon (E. Cheel); " White Gum," brittle wood, Hesket, 2,000 feet, near Mount Macedon (J. M. Griffiths); Heathcote and Macedon (W. S. Brownscombe, 19a); Gisborne (J. Staer); Arthur's Creek (J. Staer); Maryborough (J. Blackburne). " Big old tree with persistent rough wrinkled bark on stem and main branches, even extending to the smaller ones; tree yielding manna." Near Castlemaine (J. Blackburne).

Dunkeld, near Mount Abrupt, Grampians, another specimen from same locality with Mueller's note, " rough bark, *not* fibrous bark." Multiflowered (Bolton).

" Blue Gum," Pyrenees (Collector?). Bright (J.H.M.).

New South Wales.

It is a denizen of well-watered, cold localities, ascending to over 4,000 feet. Passing through from Victoria it is found on the southern and northern Tablelands of the State from end to end, passing into Queensland by means of New England.

Southern Districts.—" White Gum," quite glabrous. Flowers in 3's, ripe fruits fairly well exserted, 3-celled. Immature fruits, truncate, Brown's Camp, near Delegate (W. Baeurlen); near Delegate Hill (W. Forsyth); " persistent bark at butt; above that very white." Bombala (A. W. Howitt); " Ribbony Gum," largest tree in Bombala district. Cathcart (J.H.M.).

Copy of note made at the time :—N.B.—Complete material available, " Fruits tending to sub-cylindrical like these show transition to *Gunnii* and show how difficult it is to discriminate on fruits alone." Nimitybelle (J.H.M.) Cooma, H. Deane's 228 (H. Deane and others); Sherwin Creek, McLachlan River, Bibbenluke to Dalgety. Along the creeks and on the hills with *E. coriacea* (A. W. Howitt); Towamba River, Eden (A. W. Howitt); Wyndham (J. L. Boorman); Bemboka (A. W. Howitt); Yourie, 30 miles west of Bermagui (W. Dunn); Moruya (J. L. Boorman); Wog Wog, Currockbilly (J. L. Boorman); Araluen Mountain (J.H.M.); Jillamatong Mountain, near Braidwood. The only species on the mountain (J. L. Boorman); Sugar Loaf Mountain, Braidwood (W. Baeuerlen); " Grey Gum," Braidwood, with suckers broader than usual; " Ribbony Gum," Braidwood (J. S. Allan); Sassafras, Nowra Road (J. L. Boorman); Turpentine, near Nowra (J. L. Boorman); " Manna Gum," Dalgety

(A. W. Howitt); Yarrangobilly (W. Forsyth); "White or Drooping Gum," Tumberumba (W. Kopsen); Laurel Hill, Tumberumba (R. H. Cambage); Talbingo, *viâ* Tumut (A. W. Howitt); Batlow (A. W. Howitt); "A tree like *viminalis*, only very inlocked, and will not split," Tumut (A. Murphy). These specimens are an absolute match of those named *E. crucivalvis* by Mueller.

Lake George (H. C. Russell); Yass (Revd. J. W. Dwyer, No. 60); Yass Junction (W. M. Carne); Kenmore, near Goulburn, "White Gum" (J.H.M.); Goulburn (Revd. J. W. Dwyer); Towrang (J. L. Boorman); Wingello (J. L. Boorman); Box Point to Barber's Creek (J.H.M.); Gillen Bullen, Berrima (R. T. Baker).

Western Districts.—On basalt and on sandstone at Mount Wilson; at Hassan's Walls, and thence to Cox's River; also Lowther Road, Mount Victoria, into Kanimbla Valley; also Jenolan Caves (J.H.M.).

Mount Wilson, with crimson, also the ordinary white flowers (Jesse Gregson); Lowther Road, Kanimbla Valley, intensely yellow filaments (J.H.M.); Cox's River (R. H. Cambage and J.H.M.).

Juvenile leaves from same tree vary in size from $3\frac{1}{2}$ to 12 inches long, and from $\frac{3}{4}$ to 2 inches broad, Mount Blaxland to Rydal (R. H. Cambage and J.H.M.); Jenolan Caves. Broadish suckers and rather large fruits (W. F. Blakely); Oberon (R. H. Cambage); Rockley (J. L. Boorman); Perth, filaments intensely yellow (J. L. Boorman); Bathurst (H. G. Smith and Dr. H. I. Jensen); Blayney (J.H.M.); Mount Macquarie (J. L. Boorman); 16 miles from Orange on Cargo Road (R. H. Cambage); Bathurst to Sofala (R. H. Cambage and J.H.M.).

"Ribbon Gum" or "Mountain Ash." "Cut up at the local mills and sold as Ash. Timber considered valuable for inside work. Grows to a tremendous height, about 150 feet, has a long clean barrel. Rolls of ribbon-like bark hang on the trunks of the trees." Parish of Turon, County Roxburgh (A. R. Samuels).

"White Gum" stem-clasping juvenile leaves. Sunny Corner (J.H.M. and J. L. Boorman). Ben Bullen and Capertee (J.H.M. and J. L. Boorman); between Ilford and Capertee, at foot of Cherry Hills (A. Murphy); "Ribbon Gum," Nullo Mountain, Rylstone (Forester Sim) with diameter 3 feet at 3 feet from ground, pointed opercula; Grattai, *viâ* Mudgee (J. L. Boorman); Hargraves (J. L. Boorman).

Northern Districts.—Howe's Mountain, near Singleton (J. L. Boorman); Moonan Brook or Flat, 9 feet diameter. Rough-butted from 30 feet up to 3rd fork, yet typical *viminalis*. Moonan Flat and Brook, on the Hunter River, typical *viminalis* (no hard bark). Up to 9 feet in diameter, rough-butted for 30 feet up to 3rd fork. Fruits in 3's, 4's, 5's, 6's, and 7's (J.H.M. and J. L. Boorman); Stewart's Brook, truncate look of unripe fruits (J.H.M.); Murrurundi. Fruits in 3's and 4's (L. A. Macqueen, W. F. Blakely; Nundle, fruits in 3's, and multi-flowered (M. H. Simon, J. L. Boorman); White-boled Gum, the lowest 6 feet carrying rough bark. On low ground, Nundle

Common, 1,800 feet (E. Julius); "Ribbon Gum," Hanging Rock, *viâ* Nundle (E. Julius); Walcha, fruit in 3's (J. L. Boorman); Tia, near Walcha, up to 4's and multiflowered. "Ribbony Gum" (J.H.M.).

"White Gum." Fruits up to 4's and 5's. Between Myrtle Scrub and Yarrowitch. The trees are straight, handsome-looking, up to 3 feet in diameter, and as high as *obliqua*. The bark is more or less rough at the butt; above this the bark is thin, falling off in ribbons. This *viminalis* forest (mixed with *E. obliqua*) is in rich basaltic soil; in poorer ground towards Walcha the *viminalis* trees are much inferior. On a ridge near Tia I observed a *viminalis* tree with larger fruits; 17 miles east of Walcha, on a flat, may be observed many trees with perfectly smooth trunks, with plum-coloured patches thereon. They have glaucous, plum-tinted, broadish (ovate-lanceolate) suckers, but are, nevertheless, undoubtedly *viminalis*. For many miles before Walcha is reached *E. viminalis* is exceedingly abundant, but most of the trees are of the usual Ribbony Gum type, with all stages of twistiness of the ribbony bark, and with much variation in the amount of rough bark at the butt (J.H.M.).

Tree of 35 feet, smooth bark with loose shaggy butt, on creek, Ph. Royinn, Co. Parry (E. H. F. Swain), in 3's with broad juvenile foliage. Uralla, up to 4's, red flowered (H. Deane); Armidale (J. L. Boorman); Tingha to Guyra (J. L. Boorman and J.H.M.); banks of McIntyre River at Inverell (J.H.M.); Chandler and Styx Rivers (A. W. Howitt); "White Gum," Guy Fawkes (W. MacDonald); Ben Lomond, up to 6's (W. Dunn and J.H.M.); Glen Innes, large fruits up to 4's, and very exserted valves. Glen Innes, multiflowered (H. Deane and J. L. Boorman); Glen Elgin (J. L. Boorman).

"White Gum."—When once the Dorrigo Mountain is ascended, and one is fairly on the reserve, it will be found that there is but one species of Eucalyptus, a White Gum. It is to be found all over the reserve, on the open country, fringing the plains fronting the Beilsdown, Murray, and Nymboida Creeks. It is *E. viminalis*. The timber of *E. viminalis* is usually looked upon as the reverse of durable; in fact, it bears a very bad name. But this Dorrigo white gum timber is anything but useless. It is not first-class, but it is a good timber. I was shown a stockyard which had been made of this timber thirty years ago (there is no other Eucalyptus timber anywhere near); and posts and rails were but little the worse for wear. I carefully examined into the timber and into the circumstances of its use, and the value of *E. viminalis* timber has certainly increased in my estimation; up to 6's (J.H.M., 1893).

"White Gum" grows about 60 to 100 feet, about 6 feet girth. Timber is light-pink to white in colour, splits well, but is very spongy and is no good in the weather. Grows in rather poorer soil than red gum, sometimes mixed with it in the same situation. Fair burner, no good for mill on account of lack of durability (Robert Kaleski, Mountain Top, Dorrigo).

Young shoots long, opposite, narrow. Some of the buds with rather blunt opercula. Fruits rather small, up to 6's and 7's (The Bluff, Tenterfield, Henry Deane, No. 314).

Tenterfield to Sandy Flat, some juvenile leaves quite broad (J.H.M.); "All the trees noticed have flaky bark at the base, none smooth; all multiflowered. Along creek bank, Wilson's Downfall (R. H. Cambage, No. 2,842); banks of Kooreelah Creek, Wilson's Peak, Macpherson's Range, multiflowered (W. Dunn).

QUEENSLAND.

It is found in the New England portion of this State, but the area in which *E. viminalis* occurs requires to be more properly defined.

AFFINITIES.

At page 167 I have already referred to the reputed synonymy of *E. viminalis* as understood by Bentham in B.Fl. iii, 240.

This species has generally been considered to have close affinity to *E. Gunnii* Hook. f. By that is meant what we know now as the *Gunnii* group, and the two members to which it is nearest related are *E. maculosa* R. T. Baker and *E. ovata* Labill.

1. With *E. maculosa* R. T. Baker.

Consider Plate 112 (Part XXVII). Speaking generally, the juvenile leaves of *E. maculosa* are shorter, broader, and more rigid. *E. maculosa* is much more frequently multiflowered, and the valves are rarely so much exsert. *E. maculosa* is a smaller tree and prefers drier situations, being a White Gum with blotches or a small amount of flaky bark; *E. viminalis* is a larger, bulkier tree of river banks and damp lands, and a decidedly Ribbony Gum.

2. With *E. ovata* Labill.

Here the resemblance is less close; compare Plates 113 and 114 of Part XXVII. At the same time this species, in Tasmania and Australia, has been confused with *E. viminalis*.

Both are denizens of damp lands, but *E. ovata* has broader juvenile leaves, and at the same time usually broader mature leaves; it is multiflowered, and the fruits usually, but by no means invariably, have a different shape.

3. With *E. Baeuerleni* F.v.M.

The relations of these two species are even closer, and will be dealt with in Part XXIX.

4. With *E. Smithii* R. T. Baker.

This is a species which was confused for many years with *E. viminalis*. Compare the figures 1 and 2 of Plate 55. The juvenile and mature leaves are a good deal similar. Those of *E. Smithii* yield a valuable oil, while those of *E. viminalis* do not. *E. Smithii* is multiflowered, while *E. viminalis* usually has flowers in threes, while it much less rarely has them in fours and even more, but while multiflowered individuals may be abundant in a particular district they are few in comparison with the total of the normal form.

But the anthers are very different, those of *E. Smithii* being renantherous and those of *E. viminalis* having parallel cells.

The fruits of *E. Smithii* are, as a rule, smaller, and the tips of the valves more incurved than those of *E. viminalis*.

E. Smithii is a comparatively erect tree; *E. viminalis* is a bulkier, more scrambling tree, with inferior timber, which is pale coloured in both species.

5. With *E. dealbata* A. Cunn.

. . . . "Seems merely an abnormal state of *E. viminalis*, standing to it in the same position as . . . . *E. melanophloia* to *E. crebra* . . . . ." ("Eucalyptographia" under *E. viminalis*).

The position of *E. dealbata* is nearer to that of *E. tereticornis*, as will be observed when *E. dealbata* is described in the present work. *E. dealbata* is a tree of dry situations, with broad juvenile leaves and deep red timber.

Explanation of Plates (116–119).

PLATE 116.

E. vernicosa Hook. f.

1. Fatigue Hill, Tasmania (R. Gunn's No. 1113, 4th April, 1842). Type of the species. Note that the buds are not solitary, but in threes. Leaves not opposite.

2*a*. Twig with buds, flower and fruit; 2*b*, twig with fruit; 2*c*, anthers. La Perouse, Tasmania. (L. Rodway.) Buds and fruit solitary.

3. Pointed leaf and conical operculum. Bud solitary. Plant 1½-3 feet high. Mt. Sorell, Macquarie Harbour, Tasmania, 3,000 feet (R. Gunn's No. 1113, 8th December, 1846). Note that two distinct specimens are the No. 1113 of R. Gunn.

4. Twig with buds in threes and relatively large leaves. (Collector of Baron von Mueller.)

E. Muelleri T. B. Moore.

5*a*. Juvenile leaves, almost in the opposite stage; 5*b*, small mature leaf and buds. Tasmania. (L. Rodway, December, 1897.)

6*a*. Juvenile leaves; 6*b*, fruits. The Springs, Mount Wellington, Tasmania. (J.H.M. and R.H. Cambage.) Note the affinity in the leaves to *E. vernicosa*.

7*a*. Mature leaf; 7*b*, buds; 7*c*, immature fruits. The Springs. (R. H. Cambage, No. 4003.)

8*a*. Mature leaf and buds; 8*b*, anthers. Mount Field East, 4,000 feet, Tasmania. (J.H.M.) This form shows transit to *E. vernicosa*. Compare figure 4 of the present Plate.

PLATE 117.

E. Kitsoniana (Luehmann) Maiden.

1*a*. Juvenile leaf; 1*b*, mature leaf with fruits. Near Foster, South Gippsland, Victoria. (A. W. Howitt.)

2*a*. Narrow leaf with pointed opercula to flower buds; 2*b*, leaf (also small) with buds; 2*c*, anthers. Powlett Plains, South Gippsland. (E. Kitson.)

E. viminalis Labill.

3. Twig from figure of type in Labillardière's "*Plantæ Novæ Hollandiæ*," Vol. ii, Plate 151.

4*a*. Fruits; 4*b*, anthers. Risdon river side near Hobart, Tasmania, 10th October, 1840 (R. Gunn's No. 685).

5*a*. Mature leaf; 5*b*, fruits, not sessile. Foot of Cumming's Head, Northern Tasmania. (W. H. Archer.)

6*a*. Mature leaf; 6*b*, buds; 6*c*, fruits. Circular Head, Tasmania (portion of 1090, R. Gunn).

7. Immature fruits. Mt. Gambier, South Australia. (W. Gill.)

8. Mature leaf and fruits with much exserted valves, type of *E. crucivalvis*, F.v.M. Lofty Range, South Australia. (Mueller.)

PLATE 118.

E. viminalis Labill.

1*a*. Juvenile leaves; 1*b*, small immature fruits, scarcely domed. Eight-mile Swamp, Port Road, Gippsland. (A. W. Howitt.)

2. Fruits in more than threes. Dunkeld, near Mt. Abrupt, Victoria. (Bolton.)

3*a*. Coarse juvenile leaves; 3*b*, pointed, pedicellate buds (in more than threes); 3*c*, anthers; 3*d*, fruits. Wild Horse Creek, Gippsland. (A. W. Howitt.)

4*a*. Juvenile leaves, nearly in opposite state (adventitious growth); 4*b*, mature leaf; 4*c*, buds (in more than threes); 4*d*, fruits. Snowy River, Victoria and New South Wales. (A. W. Howitt.)

5. Long narrow leaf and buds in more than threes. Little River, Victoria. (Fullagar.)

PLATE 118—*continued.*

E. viminalis Labill.—*continued.*

6. Small fruits. Anderson's Creek, Victoria. (C. Walter.)

7. Large fruits. Maryborough, Victoria. (J. Blackburne.)

8*a*. Mature leaf and buds; 8*b*, small fruit, tips of valves scarcely exsert. The beaked operculum specimen is the var. *rhynchocorys*, F.v.M., but it is not uncommon in the species (compare 3*b* of this Plate, also 5*a* of Plate 119). Snowy River. (Mueller.)

9*a*. Mature leaf; 9*b*, inflorescence, of var. *racemosa*, F.v.M. Port Phillip, Victoria. (Mueller.)

10*a*. Mature leaf; 10*b*, buds (ten in the head!) Turpentine—Nowra Road, New South Wales. (J. L. Boorman.)

11. Fruits with the valves fully exsert, even more so than those of *E. crucivalvis* F.v.M. (See figure 8 of Plate 117). Tumut, New South Wales. (A. Murphy.)

12*a*. Buds while the leaves are still in the juvenile stage (12*b*, buds a little further advanced.) Sassafras—Nowra Road, New South Wales. (J. L. Boorman.)

13. Fruits, while the leaves are still in the juvenile stage. Cooma, New South Wales. (J. L. Boorman.)

PLATE 119.

E. viminalis Labill.

1*a*. 1*b*. 1*c*. Juvenile leaves, still in the opposite stage. Cox's River, New South Wales. (R. H. Cambage and J.H.M.) Note the remarkable variation in the width and size of the leaves. These, and others, were collected from the same tree, and attached to the sheet of specimens is a statement, signed by Mr. Cambage and myself, certifying to authenticity of the specimens and their remarkable character.

2. Large juvenile leaves. Bathurst to Sofala, New South Wales. (R. H. Cambage and J.H.M.)

3. Stem-clasping juvenile leaves. Sunny Corner, New South Wales. (J. L. Boorman.)

4. Wide-mouthed fruits. Ilford to Capertee, New South Wales. (A. Murphy.)

5*a*. Buds with long-pointed opercula; 5*b*, fruit. Bathurst, New South Wales. (H. G. Smith.)

6. Juvenile leaves. Piri Brush, Upper Hunter, New South Wales. (Leichhardt, January, 1843.)

7. Fruits in more than threes. Moonan Flat, Upper Hunter, New South Wales. (J.H.M. and J. L. Boorman.)

8. Buds, numerous in head, pointed opercula. Myrtle Scrub to Yarrowitch, New England, New South Wales. (J.H.M.)

9. Oval buds. Summit of hill 3 miles east of Tia, towards Walcha, New South Wales. (J.H.M.)

10. Pointed buds, with rather long pedicels. Walcha Road, New South Wales. (J. F. Campbell.)

11*a*. Juvenile leaves, still in the opposite stage; 11*b*, remarkably large leaf, still in the opposite stage, although the opposite leaf is not shown; 11*c*, fruits, which are on the previous year's wood. Parish of Royinn, county Parry, New South Wales. (E. H. F. Swain.) This shows, in a remarkable manner, how great the variation may be in the juvenile leaves of this species. Such leaves could certainly not be termed "narrow."

12*a*. Mature leaf; 12*b*, small buds (more than threes); 12*c*, small fruits. Salisbury Plains, Uralla, New South Wales. (T. G. Adamson.)

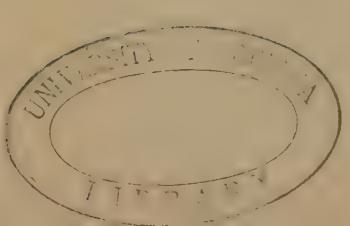
13. Fruits (more than threes). Glen Innes, New South Wales. (J. L. Boorman.)

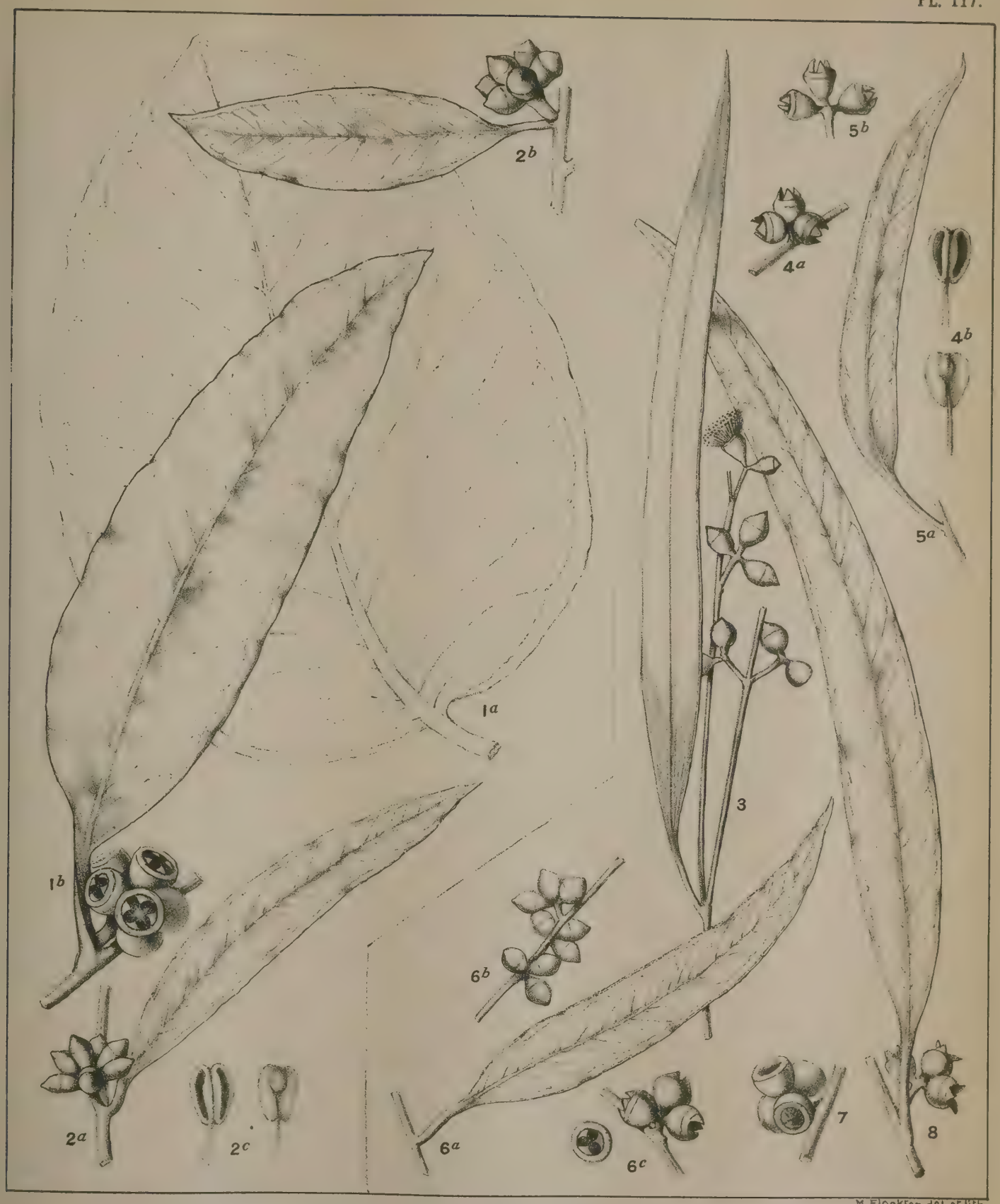
14*a*. Buds with pointed opercula (compare figure 8*a*, Plate 118); 14*b*, very large fruits, with especially exserted valves. Glen Innes, New South Wales. (H. Deane.)

M. Flockton del et lith.

EUCALYPTUS VERNICOSA Hook. f. (*1–4*)

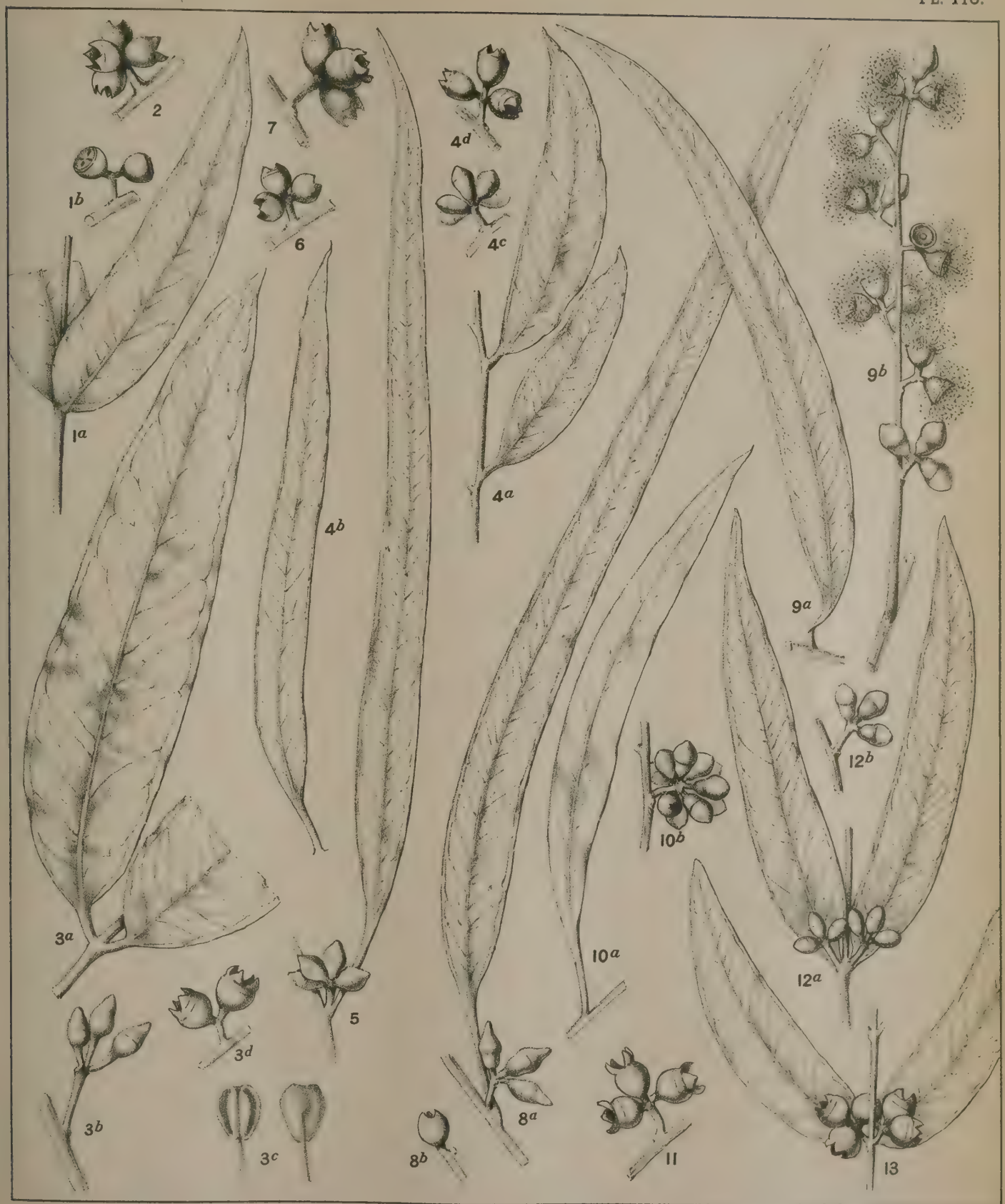
E. MUELLERI T. B. Moore. (*5–8*)





EUCALYPTUS KITSONIANA MAIDEN. (*1–2*)

E.VIMINALIS LABILL. (*3–8*). [See also Plates 118 and 119.]



EUCALYPTUS VIMINALIS LABILL. [See also Plates 117 and 119.]

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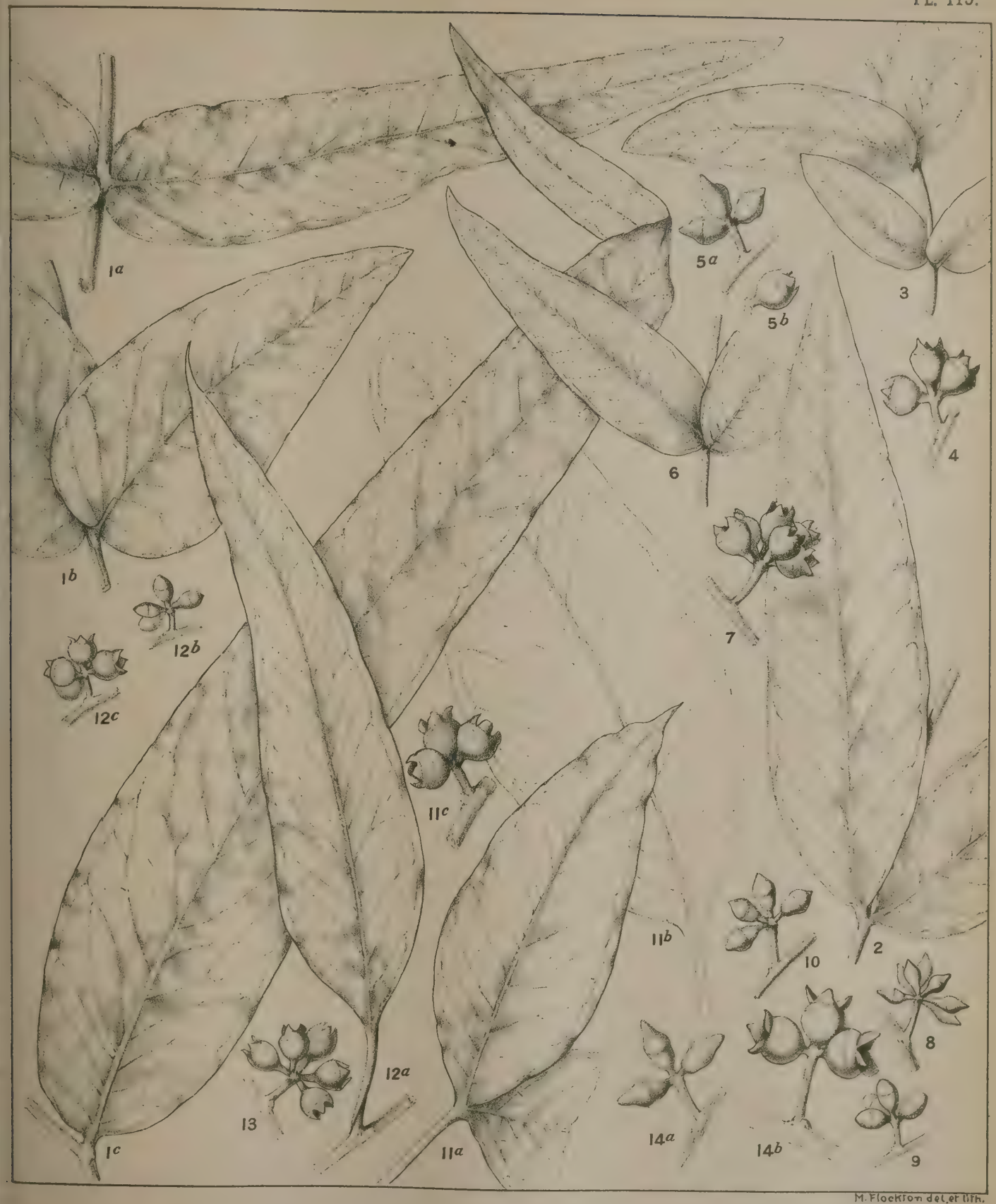

EUCALYPTUS VIMINALIS LABILL. [See also Plates 117 and 118.]

LIBRARY

The following species of Eucalyptus are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets :—

acacioides A. Cunn (xlviii).
acmenioides Schauer (xxxii).
affinis Deane and Maiden (lvi).
amygdalina Labill. (xvi).
Andrewsi Maiden (xxi).
Baileyana F.v.M. (xxxv).
Baueriana Schauer (lvii).
Baueriana Schauer, var. *conica* Maiden (lviii).
Behriana F.v.M. (xlvi).
bicolor A. Cunn. (xliv).
Boormani Deane and Maiden (xlv).
Bosistoana F.v.M. (xliii).
Caleyi Maiden (lv).
capitellata Sm. (xxviii).
Consideniana Maiden (xxxvi).
coriacea A. Cunn. (xv).
corymbosa Sm. (xii).
crebra F.v.M. (liii).
dives Schauer (xix).
fruticetorum F.v.M. (xlii).
gigantea Hook. f. (li).
goniocalyx F.v.M. (v).
hæmastoma Sm. (xxxvii).
hemiphloia F.v.M. (vi).
longifolia Link and Otto (ii).
Luehmanniana F.v.M. (xxvi).
macrorrhyncha F.v.M. (xxvii).
maculata Hook. (vii).
melanophloia F.v.M. (liv).
melliodora A. Cunn. (ix).
microcorys F.v.M. (xxxviii).
microtheca F.v.M. (lii).
numerosa Maiden (xvii).
obliqua L'Hérit. (xxii).
ochrophloia F.v.M. (l).
odorata Behr and Schlechtendal (xli).
oleosa F.v.M (lx).
paniculata Sm. (viii).
pilularis Sm. (xxxi).
piperita Sm. (xxxiii).
Planchoniana F.v.M. (xxiv).
polyanthemos Schauer (lix).
populifolia Hook. (xlvii).
punctata DC. (x).
regnans F.v.M. (xviii).
resinifera Sm. (iii).
saligna Sm. (iv).
siderophloia Benth. (xxxix).
sideroxylon A. Cunn. (xiii).
Sieberiana F.v.M. (xxxiv).
stellulata Sieb. (xiv).
tereticornis Sm. (xi).
virgata Sieb. (xxv).
vitrea R. T. Baker (xxiii).

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Sydney: William Applegate Gullick, Government Printer.—1918.

A Critical Revision of the Genus Eucalyptus

BY

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.

(Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney).

Vol. III. Part 9.

Part XXIX of the Complete Work.

(WITH FOUR PLATES.)

"Ages are spent in collecting materials, ages more in separating and combining them. Even when a system has been formed, there is still something to add, to alter, or to reject. Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages. In these pursuits, therefore, the first speculators lie under great disadvantages, and, even when they fail, are entitled to praise."

MACAULAY'S "ESSAY ON MILTON."

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CXLIX. Eucalyptus Baeuerleni F.v.M.

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DESCRIPTION.

CXLIX. E. Baeuerleni F.v.M.

In *Victorian Naturalist* vii, 76 (1890).

Shrubby or arborescent; *branchlets* rather robust, angular when young; *leaves* scattered, on comparatively short petioles, thickly chartaceous, mostly falcate-lanceolar, dark green on both sides, without conspicuous lustre; their venules subtle, rather close, moderately spreading, the marginal one distinctly removed from the edge of the leaf; oil-dots copious but faint; *peduncles* axillary, solitary, very short, broadish, compressed, usually three-flowered; pedicels only very little developed or quite obliterated; *tube of the calyx* almost semi-ovate or more hemi-ellipsoid, slightly angular; *operculum* somewhat shorter than the tube, its lower part rather depressed, the upper somewhat suddenly ending in a narrow point; stamens all fertile, *filaments* yellowish-white except the reddish base, infracted before expansion; *anthers* pale, nearly ovate, opening by longitudinal slits; *style* short, stigma hardly broader than the style; *fruit* somewhat large, nearly semi-ovate, its border narrow, slightly channelled; valves three or four, arising considerably below the border, semi-exserted, rather pointed; *fertile seeds* almost ovate, without any appendage, larger than the sterile seeds, flat or angular on the inner side.

Thinly few- or many-stemmed, flowering at a height of 5 feet but attaining to 40 feet. Bark smooth, brownish outside, the outer layers seceding. Leaves to 7 inches long and to 1 inch broad, generally with a reddish edge. Calyx inside near the margin often red. Style usually red. Fruit often fully one-third of an inch long. (*Op. cit.*)

"The bark, which is smooth along the whole length of the stem, even on the largest trees, also appears to be characteristic in its peculiar brown colour, which I have not noticed in any other species yet (he is speaking of southern New South Wales.—J.H.M.).

The timber is exceedingly hard to cut with the axe, but beautiful to cut with the saw, it is very firm and compact, much harder and much heavier than the timber of *E. stricta*, growing in or nearest the same situation, also amongst rocks. There can be very little doubt, to judge from its situation, from the hardness and compactness of its timber as well as from its weight, that *E. Baeuerleni* must be of very slow growth. Kino appears to be exceedingly scarce." (W. Baeuerlen in a letter, 1890.)

Tested under my direction at the Technological Museum, the following report was given :—

"Of a pale colour, shrinks unequally in drying. Is exceptionally heavy and close in the grain. It works remarkably well, and is suggested for use for cogs."

SYNONYM.

E. viminalis Labill.: var. ***Baeuerleni*** Deane and Maiden, *Proc. Linn. Soc. N.S.W.* xxvi, 142 (1901).

RANGE.

It has hitherto only been found in two localities, both in New South Wales, viz. :—On the Sugar Loaf Mountain, near Braidwood, by the original discoverer, and in gullies around Wentworth Falls, Blue Mountains, by the late W. Forsyth.

In the original description the locality is stated as " On rocky declivities of the Sugar-Loaf Mountain, towards the sources of the Clyde, at elevations between 2,500 and 4,000 feet, together with *Eriostemon Coxii* and *Hakea Macræana*."

The following particulars concerning the habitat, variation in growth, and plant associations of this species were communicated to me by Mr. Baeuerlen at the time of its discovery :—

Though it ascends as a small weak straggling shrub, nearly to the very top of the Sugar Loaf Mountain (3,800 feet) yet its normal situation is a steep almost vertical and widely broken up mountain side, for there amongst broken cliffs and boulders it attains tree size, reaching a height from 40 to 60 feet, and a diameter from 6–12 inches, the maximum sometimes 15 inches. Intermediate between the top, where it is a weak shrub 4–5 feet in height and hardly 2 inches diameter, and yet heavily laden with fruit, and the steepest region, there is a belt not quite so steep with a layer of soil, where it occurs more in mallee form, sometimes more than a dozen stems springing from one rootstock, in fact in one instance I counted sixteen stems. Farther down amongst the rocks and in the steepest place it grows to tree size, mostly with one stem only, each stem having a considerable rootstock or butt, somewhat in the manner of the Musk (*Olearia argyrophylla*). Old decayed or burnt out rootstocks of considerable size are plentiful, sometimes from 3–4 feet in diameter. From those sometimes spring half a dozen or more trees from 6–9 inches in diameter. It is also noteworthy that though for the first few hundred feet down the mountain *E. stricta* accompanies the new species, but leaves it when it reaches the steepest and most rocky situation, no other Eucalypt is then associated with it any more until it approaches its lowest elevation, when Messmate (*E. amygdalina*) and Stringybark (*E. capitellata*) accompany it. I took particular notice of the fact, whether in this very wild situation other species of trees would form those butts, but found no other trees growing there, whether Eucalypts, Acacias or others, forming those butts in the same situation, so that I may assume that they are peculiar to the species and form one of its characteristics.

For the present I believe that *E. Baeuerleni* will be found to be confined to this mountain-side and a small narrow hill abutting on this mountain-side, which has one side covered with the species while the other (south-eastern) side has not a single tree on it.

AFFINITIES.

1. With *E. viminalis* Labill.

" It recedes mainly from *E. viminalis* in leaves with thinner venules and more conspicuous oil-dots in the *flattened* and also often *thicker* and *shorter peduncles*, in the angular *calyx-tube*, in the shape of the operculum, and again in the larger fruits with half-enclosed valves of greater length and narrow rim." (Original description.)

E. Baeuerleni is one of those species in which each bud has a sharp rim, showing the junction of the slightly wider calyx-tube and operculum. This indicates a second deciduous operculum to each bud.

This does not appear to obtain in *E. viminalis*. The latter frequents banks of rivers and swampy places; the former is a denizen of dry hills, so far as we know at present. At the same time I do not know any species which it resembles more closely than that of *E. viminalis*.

2. With *E. Gunnii* Hook. f.

"It differs from *E. Gunnii* in the marked curvature of the leaves and their thinner venules, reduced inflorescence, constant obliteration of pedicels, somewhat angular calyx-tube, longer pointed lid, larger fruits less downward attenuated and rather long-valved, also in the foliage of the young seedlings." (Original description.)

E. Gunnii and *E. Baeuerleni* are sharply separated from each other by the broad juvenile leaves of the former; the mature foliage is also shorter and the venation different. Compare Plate 108 of Part XXVI.

3. With *E. goniocalyx* F.v.M.

"This species in many respects approaches *E. goniocalyx*, but the leaves are of a darker green, have the venules more immersed, and are more pellucidly dotted; the peduncles are shorter and bear a lesser number of flowers." (Original description.)

Compare Plate 81, where it will be seen that the buds and fruits of *E. goniocalyx* are sufficiently different. As a very general rule the juvenile foliage of the two species does not present a close resemblance, but, exceptionally, the juvenile foliage (compare fig. 1 of Plate 81) of *E. goniocalyx* may resemble that of *E. Baeuerleni*, but, even then, the leaves of *E. goniocalyx* are more cordate, and the young stems more quadrangular.

Mueller, however, at the time he described *E. goniocalyx* considered it to include his *E. elæophora* (compare Plate 82), but the juvenile leaves of *E. Baeuerleni* and *E. elæophora* are sharply different and so indeed are the buds, though in the case of some of the larger fruits of *E. elæophora* there is some resemblance, although one or more angles is prominent as a rule in the fruits of *E. elæophora*. *E. goniocalyx* is a large tree.

4. With *E. leucoxylon* F.v.M.

"The lid is much pointed, almost like that of *E. leucoxylon*." (Original description.)

I do not think a general comparison is intended. The juvenile leaves of the two species are very different.

5. With *E. resinifera* Sm.

"The fruit is larger and nearly as broad as long with elongated and thus much emerging valves, hence more like that of *E. resinifera*, and the leaves of young seedlings are from roundish-oval to elliptic and soon scattered." (Original description.)

E. resinifera is a red-wooded, fibrous-barked species; the two species have no close affinity.

DESCRIPTION.

CL. E. scoparia Maiden.

In *Proc. Linn. Soc. N.S.W.* xxix, 777 (1904).

A SLENDER tree of 30 or 40 feet, with narrow pendulous shiny foliage, and an entirely smooth white bark.

Juvenile leaves lanceolate, symmetrical, tapering to a very short petiole and to a fine-pointed apex. Equally green on both sides. Strictly opposite; penniveined, the lateral veins very fine and anastomosing, the principal lateral veins making an angle of about forty-five degrees to the midrib. Entirely glabrous, and the twigs reddish and terete.

The opposite-leaved character is retained for a considerable period, the leaves becoming thicker, narrower and longer. I have leaves, still in the opposite stage, 3 inches long and $\frac{1}{5}$ inch wide. In this stage the foliage resembles that of *E. amygdalina* (particularly the type Tasmanian form) or of *E. linearis* a good deal. It is seen to have a translucent margin and to be full of oil-dots, emitting a peppermint odour when crushed in the warm hand.

Mature leaves up to 6 inches long and $\frac{1}{2}$ inch broad, tapering very gradually into a fine apex. At the base it tapers less gradually into a petiole of perhaps 1 inch. Texture thickish, the midrib alone conspicuous.

Buds nearly ovoid when ripe, with a hemispherical or slightly pointed operculum. Calyx tapering into a short pedicel which may be absent. Peduncle may be $\frac{1}{4}$ inch. Usually three to seven in a head.

Flowers opening in longitudinal parallel cells.

Fruits smooth, usually barely $\frac{3}{16}$ inch in diameter, subcylindrical, rim rather prominent, domed, the valves (indifferently three or four) moderately well exserted.

Bark very smooth and white.

Timber pale-coloured, fissile, probably of no special merit. (*Op. cit.*)

RANGE.

On the tops of the highest hills (circa 4,000 feet), in fissures of granite rocks around Wallangarra, occurring on both sides of the New South Wales–Queensland border (J. L. Boorman).

The type thus comes from northern New England. The name "Wallangarra White Gum" has been suggested for it.

C. Stuart collected it on New England, probably near Timbarra, where a good deal of his New South Wales collecting was done.

AFFINITIES.

1. With *E. viminalis* Labill.

From *E. viminalis* it is separated by its uniformly multiflowered character, the absence of ribbons on the bark, the narrower juvenile foliage, the, as a rule, narrower mature foliage, the smaller fruits with valves less exsert.

It is the specimen "New England, *C. Stuart*," so named by Bentham in B.Fl. iii, 240. Stuart's specimen was numbered 123, with the note "Bark very smooth and white."

It is not a denizen of swampy localities, as is *E. viminalis*. At the same time, it appears to me to be closest to that species.

2. With *E. rubida* Deane and Maiden.

There is more than a general resemblance between *E. scoparia* and some northern multiflowered forms of *E. rubida*, but they are sharply separated by the broad juvenile leaves of the latter species.

3. With *E. Smithii* R. T. Baker.

There is some general resemblance in herbarium specimens between *E. scoparia* and *E. Smithii* R. T. Baker, from which it appears to be sharply separated by the markedly smooth bark of the new species. The bark of *E. Smithii* is almost an Ironbark. The timber also of *E. Smithii* appears to be darker. The anthers are very different, those of *E. Smithii* being almost renantherous.

4. With *E. Seeana* Maiden.

In its narrow pendulous juvenile leaves and smooth bark it reminds one of *E. Seeana* Maiden. The two species differ, however, in almost every other respect.

DESCRIPTION.

CLI. E. Benthami Maiden and Cambage.

Proc. Roy. Soc. N.S.W. xlviii, 418 (1914).

Arbor magna erecta, "White" vel "Flooded Gum" vocata, cortice basi plusve minusve secendente 3–4 ft. diametro, 60–100 ft. alta, ligno pallido et non duro, foliis juvenibus tenuissimis glaucis infra pallidioribus lanceolatis ad ovato-lanceolatis cordatis, foliis maturis sub-glaucis lanceolatis, alabastris ad 7 in umbella leniter urceolata, operculo acuminato, pedicellibus brevibus, umbella in pedunculo gracile circiter ·5 cm. longo, fructibus immaturis urceolatiusculis ad fere hemisphericis, margine distincto, fructibus maturis fere hemisphericis circiter ·5 cm. diametro, valvarum apicibus leniter exsertis.

A large conspicuous White or Flooded Gum, rather erect in habit, with more or less rough-flaky bark at the butt; such bark may be almost wholly absent, or sometimes extending to the first fork. The rough bark rather hard, but rarely almost fibrous, and terminating in short ribbons. Commonly 3 to 4 feet but sometimes 6 feet in diameter, and 60 to 100 feet high. Timber pale pink when fresh, and of medium hardness and fissility.

Juvenile leaves very thin, very glaucous when young, but drying nearly glabrous, paler on the underside, showing a profusion of oil-dots and distinct veins. Lanceolate to ovate-lanceolate, and cordate, amplexicaul, bluntly pointed or acute, up to 10 cm. long, by 4 cm. in greatest width.

Mature leaves slightly glaucous, lanceolate, petiolate, somewhat falcate. Midrib prominent (sometimes pinkish), the lateral veins, which are irregularly pinnate, prominent, the intramarginal vein distinctly removed from the edge. Common dimensions are 14 cm. long, 1·5–2 cm. broad, with a petiole of 2 cm.

Buds usually glaucous, up to seven in the head, slightly urceolate, operculum pointed, about half the length of the calyx-tube, which gently tapers into a short pedicel, the umbel being supported by a slender peduncle of about ·5 cm.

Expanded flowers not seen. (The anthers depicted at 6f, Plate 120, were removed from nearly plump buds.)

Fruits.—In the half-grown state glaucous, somewhat urceolate to nearly hemispherical, and with a well-defined raised rim. When ripe, nearly hemispherical, about ·5 cm. in diameter, slightly domed; tips of the valves slightly exsert.

RANGE.

So far as we know at present, it is confined to New South Wales, and to the alluvial banks of the Nepean River and its tributaries.

Type from the banks of the Nepean River near Cobbity, New South Wales (Camden district). J. H. Maiden and R. H. Cambage, June, 1913.

It is the "Flooded Gum of Camden," No. 108 of the New South Wales timbers contributed by Sir William Macarthur to the Paris Exhibition of 1855, and No. 28 of those of the London Exhibition of 1862.

Under 108, Sir William Macarthur notes in the Catalogue, "Flooded Gum of Camden, diameter 36–48 inches, 80–120 feet high. A fine-looking tree, with elegant pendant foliage; the timber not valued, being weak and perishable in comparison with many other of the common hardwoods."

Under No. 28 it is described by the same writer as "A fine looking but comparatively worthless sort; the timber weak and not durable." The diameter is given as the same, but the height is reduced to from 80–100 feet high.

It will be observed that under 108 the tree is described as of "elegant pendant foliage." Speaking generally, this is not a good description, although we have seen an odd tree to which it would apply. In the great majority of cases the trees and foliage are rather erect in habit.

In the "Flora Australiensis" (iii, 240) the specimen just mentioned (bearing the No. 108) is placed under *E. viminalis* and the record has always been accepted, *e.g.*, Woolls' "Plants indigenous in the neighbourhood of Sydney" (1st and 2nd editions).

The Nepean River trees are quite close to Camden Park and it would be impossible for Sir William Macarthur not to be familiar with them, and no other local tree could be mistaken for them. We are of opinion that *E. viminalis* Labill. should be removed from the flora of the County of Cumberland.

* * * * *

In the Kew Herbarium is a specimen labelled "No. 16, Southern district New South Wales, Macarthur and others. 'Flooded Gum.' From the London Exhibition of 1862," which appears to be referable to *E. Benthami*.

No. 16 in the official catalogue has the entry "Collected by Edward Hill, Esq., aboriginal name at Brisbane Water 'Thurambai,' vernacular name 'Flooded Gum,' a famous timber for ship-building and for house carpentry." This description can only apply to *E. saligna* Sm., but the herbarium specimens are not of that species. It is proper to refer to a numbered specimen in the principal herbarium of the world, but one cannot explain the label. To begin with, Brisbane Water is in the north, and not in the southern districts. The specimen may have been received as "Flooded Gum," and the description of a second Flooded Gum (*saligna*) other than *Benthami*, tacked on to it. The specimen was not exhibited in the previous or Paris Exhibition.

The following specimens are either referable to the present species or are closely related thereto :—

(1) Seven miles east of Walcha, J. H. Maiden, November, 1897.

A tree with box-scaly or rough apple-like (*Angophora intermedia*) bark, rough, except the ultimate branchlets; suckers ovate-lanceolate, not glaucous, except the very young tips of the branchlets of the suckers.

(2) Guy Fawkes, Armidale district, J. L. Boorman, December, 1909.

A tall tree with a fibrous bark, and claret coloured tips to branches. Reputed ocally to be a useful timber for building and fencing purposes.

AFFINITIES.

1. With *E. viminalis* Labill.

The new species has by most observers been confused with *E. viminalis*, and being a White Gum with rough bark at butt, and growing on river flats and banks of rivers explain why this view has been so prevalent. But it is more erect in habit, *E. viminalis* having more pendulous branches and more distinctly ribbony bark.

The new species has broader juvenile leaves, the foliage is sub-glaucous, the flowers are smaller and never in threes, the fruits are of a different shape, with the valves never as exsert as those of *E. viminalis*.

2. With *E. Macarthuri* Deane and Maiden.

E. Benthami is a tall, rather erect tree with a somewhat thin canopy; *E. Macarthuri* is a smaller tree with a rather umbrageous head. The bark of *E. Macarthuri* is rough, somewhat box-like, but very woolly, that of *E. Benthami* being smooth in the upper portion (a White Gum) and flaky at the base. Sometimes it is wholly smooth.

The juvenile foliage and buds are sub-glaucous in *E. Benthami*; the buds of *E. Macarthuri* are often shining and slightly smaller than those of *E. Benthami*.

The trees referred to as *E. Macarthuri* at Werriberri Creek in Proc. Linn. Soc. N.S.W. xxxvi, 553 (1911), are *E. Benthami*. Werriberri Creek is the locality better known as The Oaks, near Camden.

DESCRIPTION.

CLII. E. propinqua Deane and Maiden.

In *Proc. Linn. Soc. N.S.W.* xx, 541 (1895), with Plate xliii.

A LARGE, straight growing, cylindrical-stemmed tree, found up to 4 or 5 feet in diameter, and 120 feet and more in height.

Bark.—It has a grey dusty-looking slightly raspy appearance as regards its bark. Next to the Blue or Flooded Gum it is one of the straightest stemmed trees in the forest. The bark darkens, peels off in large longitudinal irregular patches, leaving a smooth white surface, which in course of time darkens, peels off, and the process is indefinitely repeated. The bark closely resembles, and is perhaps not to be distinguished from, that of *E. punctata*.

Timber.—Dark coloured, and so closely resembling Red Ironbark (*E. siderophloia*) that care is required to distinguish the two timbers. Inclined to have rings or "scabs" of kino, which diminishes the demand for it for sawn stuff. Very durable in or out of the ground, but its tensile strength inferior to that of the Ironbark already referred to.

Seedling leaves.—More broadly lanceolate, and with the marginal vein more distant from the edge, than in the case of the mature leaves. At first opposite.

Mature leaves.—Narrow lanceolate and very uniform. Average length 4–5 inches, breadth ¾ inch. Veins not prominent, lateral veins nearly parallel; marginal vein on or very close to the edge of the leaf as a very general rule. Edge usually slightly recurved.

Peduncles flattened.

Calyx-tube hemispherical, and longer than the operculum. Sometimes with the angles of the flattened pedicel decurrent.

Flowers in a marked manner pedicellate; usually in tens, but the umbels containing as few as five flowers.

Operculum hemispherical in general outline, but with a low pointed apex.

Stamens inflexed before expansion, the anthers opening by parallel slits, and all fertile.

Fruit very uniform in size, about 2½ lines broad by 1½ lines deep. Usually 4-celled. Occasionally 3-celled; 5-celled not seen at present. The rim usually shows two sharp edges, with the intervening space concave. The valves are well exserted.

RANGE.

This species is confined to eastern New South Wales and Queensland, usually at no great elevation above the sea. In the former State it is not known further south than the Hawkesbury River. It occurs in both States not far from the coast, in New South Wales ascending the slopes of the escarpment of the tableland. In Queensland its range has been less carefully worked out; we do not know how far it extends along the North Coast Railway.

It is frequently found on poor sandy or sandstone country, but sometimes on better soil. Its relations to soils and soil-moisture have only been imperfectly worked out.

NEW SOUTH WALES.

Wyong District (J. L. Boorman, J.H.M.); Yarramalong (W. A. W. de Beuzeville); Sandgate, Newcastle (A. Murphy); Sandgate to Waratah (R. H. Cambage, No. 730); Paterson River (J. L. Boorman); Dungog–Stroud Road (A. Rudder); "Red Gum," Dungog (W. F. Blakely); Taree (E. H. F. Swain); Port Macquarie (F. R. Brown); Beechwood, Rolland's Plains, Hastings River (J. L. Boorman); Bellinger River (F. R. Mecham); Woolgoolga (E. H. F. Swain); Woodburn, Richmond River (W. Baeuerlen); Murwillumbah, Tweed River (E. H. F. Swain); Acacia Creek, Macpherson Range, New South Wales–Queensland border (W. Dunn).

QUEENSLAND.

Northern slopes of the Macpherson Range (R. N. Jolly); Beenleigh (Dr. J. Shirley); Brisbane (J. L. Boorman); One Tree Hill, Brisbane (R. H. Cambage); Pioneer River, Moreton Bay District (Dr. Griffiths); Blackdown Tableland, also Goomboorian Range, near Gympie (R. N. Jolly); "Grey gum" from both flats and ridges, Landsborough, North Coast Railway (P. MacMahon).

AFFINITIES.

1. With *E. punctata* DC.

The timber and bark of the two species resemble each other a good deal; they may be, for all practical purposes, identical. They also agree in the flattened peduncles and the stamens (points of resemblance, however, not peculiar to these two species).

They differ in the size of the flower-buds and fruits, which in *E. propinqua* are quite small; *E. propinqua* has narrow lanceolate leaves, and also has more parallel and less prominent lateral veins than *E. punctata*. The calyx-tube and also the operculum of *E. propinqua* are more distinctly hemispherical and its flowers more pedicellate.

The fruit of *E. punctata*, though variable in size, is always larger and more cylindrical than that of *E. propinqua*.

2. With *E. saligna* Sm.

Mueller, in his later years, used to consider the species subsequently described as *E. propinqua* as a form of *E. saligna*, and a number of botanists, including myself, followed him in this respect, for a time.

E. saligna is a Blue Gum and a very straight tree, a lover of the shelter and moisture of gullies, good soil and general good conditions are necessary for its proper development. Its trunk is usually quite smooth, with the exception of a little rough bark at the butt.

E. propinqua is more spreading, has the bark in patches and timber of a darker red.

As compared with *E. saligna* the leaves are usually smaller and the venation finer and more parallel, the operculum is less drawn out to a beak, the calyx and operculum being far more globular and also smaller; the operculum is also more dome-shaped.

The fruits of *E. saligna* (compare Plates 99 and 100) are larger, those of *E. saligna* are more sessile and cylindroid; those of *E. propinqua* are more hemispherical, and have a well-defined rim.

3. With *E. viminalis* Labill.

This species, being well diffused and somewhat variable, has been used as a sort of residuary legatee both by Bentham and Mueller, for a number of forms puzzling at the time. *E. propinqua* was by both of them referred to *E. viminalis* (as well as to *E. saligna*).

E. viminalis is a white or ribbony gum, with white or pale-coloured inferior timber. It grows in moist places. *E. propinqua* is a grey gum, with deep red durable timber. It grows in dry situations.

The juvenile foliage of *E. viminalis* is usually much in evidence, that of *E. propinqua* is much less seen, and usually shorter and broader. Both in the juvenile and mature stages the foliage of *E. propinqua* has the venation finer and more parallel than in *E. viminalis*; the intramarginal vein is also closer to the edge in *E. propinqua*.

With important exceptions, the flowers of *E. viminalis* are usually in threes; it would appear that those of *E. propinqua* are never in threes.

The fruit of *E. propinqua* is smaller, more hemispherical, less domed, and with the valves usually much less exserted than in *E. viminalis*.

DESCRIPTION.

CLIII. E. punctata DC.

In *Prodromus Systematis Naturalis Regni Vegetabilis* (DC. *Prod.*), iii, 217, 1828.

Operculo conico cupulae longitudine, pedunculis axillaribus subterminalibus petiolo brevioribus pedicellisque ancipitibus, foliis oblongis basi attenuatis apice acuminatis subtus punctatis et nervo margini parallelo cinctis.

In Novâ-Hollandâ, Sieb. plant exs. nov.-holl. n. 623. Folia distinctiùs marginata quàm prioris. Operculum nullo modo constrictum. Umbellae 4–8 florae. Puncta paginae infer. folii minima nigricantia. Folia 3 poll. longa 7–8 lin. lata, petiolo 7–8 lin. longo. (v.s.) (DC. *Prod.* iii, 217).

It is figured by the same author at Plate 4 of "Mémoire sur la Famille des Myrtacées" (Tome ix, *Mém. Soc. Phys. et Hist. Nat. de Genève*, 1842). The figure is not a very good one, being of a twig in bud.

De Candolle's description is translated by Don in the following words :—

Lid of calyx conical, longer than the cupula; peduncles axillary at the tops of the branches, shorter than the petioles, and are, as well as the pedicels, two-edged: leaves oblong, attenuated at the base acuminated at the apex, dotted beneath, and girded by a nerve, which is parallel to the margin.

Operculum not constricted in any way. Umbels 4–8 flowered. Dots on the under surface of the leaves blackish. Leaves 3 inches long and 7–8 lines abroad. (*General History of the Dichlamydeous Plants* (Don) ii, 818.)

These blackish dots are almost invariably present, but often the aid of a ens is required to see them properly.

They are, however, not characteristic of *E. punctata*, being often present in *E. resinifera*, and perhaps another indication of the closeness of the affinity between these two species.

It was not described by Bentham as a separate species. He looked upon it as a variety (*brachycorys*) of *E. tereticornis*.

It was described and figured by Mueller in the following words :—

Branchlets.—Robust and very angular.

Leaves.—Scattered, elongate or sickle-shaped lanceolar, of thin consistence, beneath slightly paler and there not shining: the lateral veins numerous, very subtle, and much spreading, the circumferential vein close to the edge: oil-dots numerous, imperfectly transparent; umbels axillary and solitary, or, at the summit of the branchlets paniculated: their stalks broad and strongly compressed, bearing generally from three to ten flowers.

Calyx-tube.—Almost semiovate or nearly hemispherical, merging gradually into an angular, rather thick, stalklet, of about the same or greater or lesser length.

Operculum.—Semiovate conical, as long as the tube or somewhat longer.

Stamens.—All fertile, inflexed before expansion: anthers almost oblong, but upwards broader, opening with longitudinal parallel slits.

Stigma.—Not or hardly broader than the style.

Fruit.—Nearly semiovate, three or oftener four, rarely five-celled, not large nor angular, rim finally rather broadish, flat, or convex, valves short, deltoid, at last exserted or convergent from the rim. (Mueller, in "Eucalyptographia.")

It is a tree of large size, although not of the largest. Its height may be given as, say, 60 to 80 feet, with a diameter of 2 or 3 feet.

The term Grey Gum is applied to *E. punctata* because of the dull grey appearance of the bark. The bark has a roughish or raspy appearance, in contradistinction to a smooth and even shiny one, possessed by so many of our gums. It has smooth, white patches in places, caused by the outer layer of bark falling off. These white patches in their turn become grey, and the process of exfoliation of the bark is repeated until probably the whole of the bark on the trunk is shed at one time or another. Although rather difficult to properly describe, the bark of the Grey Gum is so characteristic that, when once pointed out it could not be confused with the bark of any other hardwood tree.

It is called " Black Box " at Capertee, owing to the darkness of the bark. The smooth bark is sometimes of a yellow ochre or pale brown colour, hence it might then be appropriately called " Brown-barked Gum."

The names " Leather Jacket " and " Hickory," which originated from the Rev. Dr. Woolls (referring to Manly specimens) are mentioned by Bentham (B.Fl. iii, 245) under *E. resinifera*, since he confused *E. punctata* with *E. resinifera*.

Mueller (" Eucalyptographia ") emphasises the names " Leather Jacket " and " Hickory," and gives one the impression that they are widely used. I have travelled extensively in *E. punctata* country, and never heard the names applied to it in my life—always Grey Gum. Dr. Woolls alone has published the names, and he probably got them from one local resident who very likely gave the names offhand.

George Caley, the botanical collector for Sir Joseph Banks, stated (9th February, 1807) that " Mandowe," or " Mundowey," was the name given by the blacks of the Sydney district. It is interesting to note that, half a century later, Sir William Macarthur gave the name " Maandowie," as the aboriginal name of the Camden blacks for the local Grey Gum.

Variety.

Variety *grandiflora* Deane and Maiden (*Proc. Linn. Soc. N.S.W.* xxvi, 133, 1901).

This is a large-flowered and large-fruited form. Leaves punctate. Buds all ovoid. Double operculum. Rim at junction of calyx and operculum very sharp. The calyx-tube usually angled. Fruits, 7 to 8 lines in diameter. Valves usually not much exserted.

The type comes from near Dungog, on a hill 7 miles on the Booral Road. Bark and timber not to be distinguished from that of normal *punctata*. There is no line of demarcation between the normal and *grandiflora* forms, the transition being gradual.

Comparing this with the normal or small-fruited form, Mr. Augustus Rudder, a forester of considerable experience, writes in the *Agricultural Gazette* :—

This is one of two trees with the same vernacular (Grey Gum). In general appearance, to the casual observer, the trees are much alike, but the leaves of this are rather broader, and its fruits and blossoms are very much larger than those of the other variety : and the trees generally are not so large, and are more limited in range of habitat, and, as a rule, do not approach so near to the coast, though I have seen it at Raymond Terrace : and near the beach at Charlotte Bay, and Wallis Lake, in this district, the two trees often grow together. I have mostly observed it on the lower ranges in the counties of Gloucester and Durham. The timber is red in colour, is hard and very lasting, and is well suited in the round for heavy timbers in bridges and culverts.

Messrs. Baker and Smith (*Research on the Eucalypts*, p. 128) have evidently overlooked var. *grandiflora* and have renamed it var. *major*, stating :—

This is a variety with larger fruits and flowers, and, as far as known, occurs only at Booral, New South Wales (A. Rudder).

The same gentlemen (*op. cit.*, p. 127) describe a var. *didyma* :—

This variety is distinguished from the type by its having two opercula to each bud, and by the difference in its oil. The outer operculum is thin, and is shed very early in the budding stage, so that it is scarcely ever to be found in herbarium material. The fruits always have a broad groove below the rim, and the leaves are also larger and thicker than those of the type, while the wood is also more open in the grain and less interlocked. Otherwise, morphologically, there is little to distinguish it from the type.

A variety cannot be established on such slender morphological grounds. Many species of Eucalyptus have two opercula to each flower-bud. In some it is more obvious than in others, the rim between calyx-tube and operculum, showing the narrower diameter of the latter, being quite obvious in some species, and giving rise to what, a number of years ago, I described as the " egg-in-egg-cup " appearance. This diminished diameter of the operculum, particularly in the young or half-grown state, is an indication of where the outer operculum was, which, when thrown off, gives the operculum the diminished diameter. In most (perhaps all) species the diameter of the operculum continues to increase after the falling of the outer operculum, and, when the inner operculum is ready to be thrown off the operculum is of the same diameter as the calyx tube.

SYNONYMS.

1. *E. tereticornis* Sm., var. *brachycorys* Benth.

2. *E. Stuartiana* F.v.M., var. *longifolia* Benth.

1. *E. tereticornis* Sm., var. *brachycorys* Benth., in B.Fl. iii, 242.

Operculum more obtuse, 3 to 4 lines long. With the other specimens from Brisbane, Macleay, and Hastings Rivers, from Parramatta and the Blue Mountains. *E. punctata* DC. founded on Sieber's specimens No. 623, which I have not seen, appears from his diagnosis and from the figure *Mem. Myrt.* : t. 4, to be the same variety *with a short operculum*, also described in a state of young bud.

When *E. tereticornis* Sm. is reached it will be observed that the species is very variable in length of the operculum, but *E. punctata* DC. is quite distinct.

2. *E. Stuartiana* F.v.M. var. *longifolia* Benth., in B.Fl. iii, 244.

"Yellow or Grey Gum and Bastard Box." Woolls in Herb. F.v.M. (Twofold Bay).

"Turpentine Gum" or "Hiccory" Oldfield, F.v.M.

In foliage and inflorescence this resembles in some measure *E. virgata*, but the buds, anthers, and fruit are quite different. In "Eucalyptographia" this is given as a synonym of *E. punctata* DC.

It is, in my opinion, referable to *E. ovata* Labill. I have explained the matter at p. 138 of Part XXVII of the present work.

RANGE.

It is confined to eastern New South Wales and Queensland. It is found in the coast districts and main dividing range and spurs. The thirty-fifth parallel of South Latitude is the most southerly range as far as we know at present. Northerly, it has not been recorded much north of the Brisbane. In the west it occurs near the Jenolan Caves and in the Mudgee district. It is usually a denizen of sandy or sterile sandstone country. It has rarely been found at an elevation much exceeding 2,000 feet.

NEW SOUTH WALES.

South.—Barber's Creek and Wingello (J.H.M. and J. L. Boorman); Berrima (J.H.M. and J. L. Boorman); Hill Top (J.H.M.); West Cambewarra (J. V. de Coque); East Bank of Woronora River, near Como, with operculum very pointed (J. H. Camfield).

Sydney District.—Garden Palace Grounds and Government House Grounds (J. H. Camfield); Belmore (W. Forsyth); Canterbury (W. Holloway); Concord (J. L. Boorman, J.H.M.); Hornsby (J. Staer); 17–18 mile post, Galston-road, Hornsby (W. F. Blakely); Kuring-gai Chase, at edge of salt water, near house-boat (W. F. Blakely); Mosman to Manly (Rev. J. W. Dwyer, Nos. 373 and 456); "Hickory and Leather Jacket" from the Manly swamps (W. Woolls); Spit-road, Manly, fruits somewhat large (J. L. Boorman).

The following were collected in the Parramatta district by Sir Joseph Banks' Collector:—

1. "'Mundowey,' February, 1805, picked up on the North Rocks" (G. Caley).
2. "Mundowey, operculum awl-shaped, 11th February, 1807" (G. Caley).
3. "Adjoining Salter's Farm, 9th February, 1807" (G. Caley).

[One of the specimens was labelled *E. botryoides*, var. *conica*.

I have referred to this at p. 51, Part XXIII of the present work, and attributed the form to *E. saligna* Sm.

The present specimen is *E. punctata* DC., as stated.]

West.—Parramatta (H. Deane), very pointed operculum; Richmond (W. F. Burrows); Springwood (J. H. Camfield); with pointed opercula, Lowther-road, Kanimbla Valley, near Mount Victoria (J.H.M.); Jenolan Caves (W. F. Blakely); Capertee (J. L. Boorman); "Slaty Gum," Capertee (J. Sim, Jr.); Spotted or "Slaty Gum," Lue (J. L. Boorman); Rylstone (R. T. Baker); Mudgee district (M. J. Wilson).

North.—Peat's Ferry, Hawkesbury River (J.H.M.); Gosford (A. Murphy); Wallsend (W. W. Forsyth); Stewart's Brook, Upper Hunter (L. A. Macqueen).

Fruits rather domed. Main southern spur of Woollooma Mountain within boundaries of F.R. 17,534, Parish of Chalmers, County Durham (H. L. White); Owen's Gap, near Scone. Seems confined to the sandstone and is not on the basalt (R. H. Cambage, No. (1,687).

Lismore, Richmond River (W. Baeuerlen). Type of var. *didyma* (Baker and Smith).

Acacia Creek, Macpherson Range (W. Dunn and J. L. Boorman).

QUEENSLAND.

South Killarney, Macpherson Range (E. S. Taylor).

Near Brisbane (F. M. Bailey); fruits rather small. Blackbutt Range (R. N. Jolly). I would like better specimens; the present ones are very imperfect.

Variety *grandiflora.*

Spit Road, Manly, Port Jackson (J. L. Boorman), amongst trees bearing fruits of the normal size; Dungog Road coming from Booral, on a hill (A. Rudder); 7 miles from Dungog (A. Rudder); Gloucester (A. Rudder).

AFFINITIES.

1. With *E. resinifera* Sm.

"It differs . . . . in its extensively smooth, not fibrous bark, less deep-coloured wood, rather thinner leaves, more visible oil-dots, partially paniculated flowers, shorter and less attenuated lid, more depressed fruit-rim, and shorter and less pointed valves." ("Eucalyptographia" under *E. punctata.*)

In the bush the two species could not be confused for a moment. *E. punctata* is a Grey Gum, while *E. resinifera* is almost a Stringybark. *E. resinifera* has also a heavier canopy of coarser foliage. The juvenile foliage of *E. punctata* is, however, broader. The operculum of *E. resinifera* is almost invariably longer. The fruit of *E. punctata* is usually cylindroid; it is only rarely that the fruits of the two species should be confused.

Fruiting specimens of *E. punctata* var. *grandiflora* (*e.g.*, fig. 1, Plate 123) and of *E. resinifera*, transit forms to *E. pellita* F.v.M. (*e.g.*, fig. 3c, Plate 126) resemble each other a good deal. The rim of the latter is vertically banded, that of the former being more horizontally so, while the buds of the large-fruited form of *E. resinifera* have the operculum greater in diameter than that of the calyx-tube.

2. With *E. tereticornis* Sm.

The fact that the illustrious Bentham looked upon *E. punctata* as a form of *E. tereticornis* is *primâ facie* evidence that there is some similarity between them. I will deal with the relations between the species when *E. tereticornis* is reached.

3. With *E. Stuartiana* F.v.M.

"From *E. Stuartiana* it is widely distant already in its leaves not of equal colour on both sides with a different venation, besides in its thick and angular branchlets, paniculated upper umbels, broad umbel-stalks, usually longer stalklets, longer lids and also the nature of the bark." ("Eucalyptographia" under *E. punctata*.)

E. Stuartiana is a "Box" barked species, the bark often resembling the back of a shorn sheep. It is a scrambling tree; *E. punctata* is more erect; *E. Stuartiana* is a pale coloured, worthless timber; that of *E. punctata* is deep red, strong and very durable. Their juvenile foliage also sharply separates them.

4. With *E. siderophloia* Benth., and *E. crebra* F.v.M.

These are two Red Ironbarks, and it is proper to remind my readers that the timbers are often confused with that of *E. punctata*. Indeed it is so much like Ironbark that it is difficult to discriminate between the timbers. That will be the best guide to its appearance. An expert would usually detect the substitution for Ironbark (if he suspected any substitution) by noting that a chip of Grey Gum is more brittle than that of Ironbark; it also cuts less horny. Nevertheless, the two timbers are wonderfully alike, and for many purposes Grey Gum is an efficient substitute for Ironbark, for it is remarkably durable. Its inferior strength, as compared with Ironbark, precludes its use as girders of any length, and when substituted for Ironbark in sleepers the bolts and spikes work loose in them.

One Ironbark has, of course, a very different appearance to a Grey Gum, and the botanical affinities are not close.

DESCRIPTION.

CLIV. E. Kirtoniana F.v.M.

In Part I of the "Eucalyptographia" (1879).

Following is the history of Mueller's species, beginning with the two published references made by him:—

1. "In the Illawarra district occurs a tree which attracted great attention in India, not only because of its rapid growth, but also as it proved the best species there to cope with the moist tropical heat. This tree has been cultivated at Lucknow by Dr. Bonavia, who recorded that it attained in the best soil 12 feet in two years; it was there considered to belong to *E. resinifera*. It differs, however, from that species in having the leaves of equal colour on both sides with more prominent veins, the intramarginal veins more distant from the edge; thus in venation, as also in odour of foliage and fruit, the tree in question approaches *E. robusta*, but its fruit is certainly similar to that of *E. resinifera*, wanting, however, the broadish outer ring around its orifice characteristic of the typical *E. resinifera*, while the lateral veins of the leaves are not quite so transversely spreading as in either. If really specifically distinct, the tree might be named *E. Kirtoniana* in honour of its discoverer." (Mueller's "Eucalyptographia," under *E. resinifera*.)

2. "A quick growing tree, rare in the Illawarra district, which at Lucknow attained a height of 45 feet in ten years, and which as a species or variety I distinguished as *E. Kirtoniana*, is in flowers and fruit nearer to *E. resinifera* than to *E. robusta*, but has the leaves of almost equal colour on both sides, thus far, and also in shape, more resembling those of *E. tereticornis*, while the bark, unlike that of *E. saligna*, is persistent. The stomates of *E. Kirtoniana* vary on the upper side of the leaf between 33,000 and 43,000, and on the lower page from 95,000 to 166,000 on a square inch, this great fluctuation being attributable probably to the age of the tree. It is particularly noticeable on account of its adaptability to a warm wet clime, and grew under Dr. Bonavia's care better than any other species in Oude; the technic value of its timber remained unascertained." (*Op. cit.* under *E. robusta*.)

The first reference is in Part I of the "Eucalyptographia" (1879). Indeed, under *E. hæmastoma* in the same work, Mueller definitely gives the date 1879 for *E. Kirtoniana*. The second reference is in Part VII. Later on (in some editions of his "Select extra-tropical plants") Mueller obviously looked upon it as a form of *E. resinifera*.

The description is unsatisfactory as measured by modern standards, but it is backed by herbarium specimens, and so, whatever the opinions of botanists as to its relationships may be, we know precisely the plant to which Mueller referred.

The specimens seen by me are labelled as follows:—

1. "*E. punctata*, DC. (*E. Kirtoniana* F.v.M.). Kirton, Illawarra." A piece from the Melbourne Herbarium, received from the late Mr. J. G. Luehmann.
2. "*E. punctata* (*E. Kirtoniana*, F.v.M.). Lucknow, India. (Cult.)"
3. "Lucknow. Comm. Dr. Brandis, July 1877."

Nos. 2 and 3 are identical. No. 2 was presented to the Sydney Herbarium by Mr. Luehmann, and No. 3, which bears the original label "*E. resinifera*," bears also the label in pencil "*E. Kirtoniana*, Müll, cf. *E. rudis*." No. 3 was presented by Kew to the Sydney Herbarium in April, 1901.

Owing to Mueller's recommendation of it as a species especially adapted for tropical cultivation, it has been extensively cultivated, particularly in Northern India, and to a less extent in North Africa.

The name of *E. Kirtoniana* F.v.M. must stand unless it be synonymous with a name which has priority. We cannot say we do not clearly know what *E. Kirtoniana* F.v.M. is, and therefore we cannot suppress it on that ground. (Maiden in *Proc. Roy. Soc. N.S.W.* xlviii, 426 [1914]).

Mr. R. T. Baker redescribed this tree under the name of *E. patentinervis* in *Proc. Linn. Soc. N.S.W.* xxiv, 602 (1899), in the following words :—

"A medium-sized tree as far as seen, with a stringy bark similar to that of *E. resinifera* Sm. Ultimate branchlets angular.

Young leaves ovate, shortly acuminate, lanceolate, thin, almost membranous, petiole slender, from 1 to 2 inches long, venation prominent, intramarginal vein removed from the edge. Mature leaves lanceolate-falcate, coriaceous, acuminate, almost a foot long in some cases, not shining, colour uniform on both sides, petiole rather slender, channelled above, venation very distinct in the coast trees, but finer in the inland ones, lateral veins very prominent and spreading, curved, numerous, the intramarginal vein removed from the edge. Oil glands very numerous.

Peduncles axillary, about an inch long, flattened, bearing about ten fairly large flowers. Calyx occasionally angular, 6 lines long. Operculum about as long as the calyx, conical, sometimes concave below the summit. Stamens long, inflexed in the bud, all fertile. Anthers parallel. Ovary dome-topped.

Fruits large, hemispherical to pyriform, on a pedicel of about 4 lines, 5 lines in diameter, rim quite 1 line broad; valves prominently exserted, acute, nearly 3 lines long.

SYNONYMS.

1. *E. patentinervis* R. T. Baker.

2. *E. resinifera* Sm., variety *Kirtoniana* Deane and Maiden.

"Buds all with a long beak and gradually tapering. Fruits about 5 lines diameter. Valves usually *very* exserted. Tendency to conical shape (when dry), but also subcylindrical. Tendency to twinning in the fruits. Rather narrow rim."

RANGE.

It is a native of eastern New South Wales and Queensland; found in barren coastal sandy localities usually at no great distance from the sea. It may ascend low coastal ridges. It is recorded from the Illawarra on the south (the precise locality is unknown), while its most northerly recorded locality is that of Fraser Island, Queensland (near Maryborough).

Following are specific localities :—

NEW SOUTH WALES.

" *E. Kirtoniana* F.v.M. (*E. punctata* DC.) Illawarra, Kirton" (copy of Mueller's label). Melbourne-street, off Parramatta-road, Five Dock, Port Jackson. A fine tree with furrowed, fibrous bark, and fruits $\frac{3}{8}$ inch broad x $\frac{3}{8}$ inch long, subcylindrical. Valves not exserted, but nearly flush with top of capsule. The Rev. Dr. Woolls, who pointed this tree out to me in 1890, considered it to be a form of *E. resinifera*, but I was inclined to look upon it as a hybrid, *E. resinifera* x *robusta*.

Penang Mountain, Gosford (A. Murphy). A gum rough to the limbs, scaly, not perfectly clean limbs. Green Point, near Gosford (A. Murphy).

" Bastard Blue Gum," grows amongst *E. robusta*. Scarce. East Gosford, in swampy land (A. Murphy).

Cooranbong (J. Martin).

" Bastard Mahogany," Bungwall (A. Rudder).

" A tall bending tree about 100 feet high, and 7 feet in girth, resembling a fine-barked Bloodwood or a Grey Box. On low swampy ground with Tea-tree, Swamp Mahogany, &c."; near Woolgoolga (E. H. F. Swain); Brunswick River (J.H.M. and J. L. Boorman).

"Ballina, on poor sandy soil associated with *E. tereticornis* Sm. and *E. corymbosa* Sm. Grows to a fairly large size, but always crooked, with a stem-diameter from 2 to 3 feet, but soon branching, the limbs long and stout, gnarled and crooked; clear trunk about 10 feet in height." (W. Baeuerlen, quoted by R. T. Baker.) Type of *E. patentinervis*.

" In the field up to about 15 inches diameter it somewhat resembles Bloodwood (*E. corymbosa*), especially in the bark, and has been cut for posts by men as Bloodwood. A closer observer, however, will at once notice the difference in the leaf, which, together with the blossom, closely resembles *E. tereticornis*. The tree is not frequent here and is generally not of a good form or size, but luck in location is probably the reason of its bad form, for I have met with one lot of young trees tall and straight which are growing under conditions more like what we would give them did we plant this species. For above reasons it has not been sawn as far as I know, and as regards its durability I could not speak with authority. (W. R. Petrie, District Forester, Fraser Island, *viâ* Maryborough, Queensland.)

AFFINITIES.

1. With *E. resinifera* Sm.

"The leaves of *E. resinifera* have 'numerous fine, close parallel and almost transverse veins, sometimes scarcely scarcely conspicuous, the intramarginal one close to the edge.' This species has more the venation of *E. tereticornis* Sm. The transverse veins are oblique and prominent, and the intramarginal one removed from the edge, particularly so in the young leaves. The venation therefore shows no connection with *E. resinifera* Sm.

. . . . The only connection apparently with *E. resinifera* is in the bark. The timber does not appear to have the reputation for quality similar to that of *E. resinifera*." (R. T. Baker.)

See my remarks which follows under *E. robusta* Sm.

2. With *E. robusta* Sm.

It seems to me that the position of *E. Kirtoniana* is between *E. robusta* Sm. and *E. resinifera* Sm. Indeed I have suggested* that *E. Kirtoniana* may be a hybrid between *E. robusta* and *E. resinifera*.

Commenting on this, Mr. W. R. Petrie, of Fraser Island, Queensland, says—

"I am interested in your suggestion that *E. Kirtoniana* F.v.M. may be a hybrid between *E. robusta* and *E. resinifera*. Here the tree does *not* resemble *E. resinifera* in the field, nor does it affect the same class of country. No *resinifera* trees are to be found here within miles of it. I have recently found trees which have clean "gum" bark for a considerable distance on the branches. The bark varies greatly, some being, as I said before, like Bloodwood (*E. corymbosa*), some just the same as *E. robusta*, and some like the rough lower portion of *E. tereticornis*. I have found none, however, resembling *E. resinifera* in the bark.

The foliage is, in all cases, in my opinion exceedingly like *E. tereticornis* and the buds are also.

In regard to Mr. Petrie's comment, he points out that the bark of *E. Kirtoniana* varies considerably, and I have not said that it is like *E. resinifera*, in the sense of *closely* resembling it. What I have said or implied, is that it is between *E. robusta* and *E. resinifera*. The former has a soft flaky-furrowed bark, and the latter has a bark which often shows characters intermediate between the Stringybarks and the Bloodwoods.

In ascertaining the affinities of species one must endeavour to assess the comparative value of all the characters taken as a whole. That is the problem that lies before me in the second part of this work, as soon as I have dealt with the separate discrimination of each species.

Passing from consideration of the barks to that of the flowers and fruits, if we compare Plate 123, Part XXIX (*E. Kirtoniana*) with Plate 124, Part XXX (*E. resinifera*), it will be seen that the buds and fruits resemble each other. The plates of *E. tereticornis* are not yet published, but at this place I may say that the buds and fruits resemble those of *E. Kirtoniana* less closely.

---

* *Proc. Linn. Soc, N.S.W.*, xxx, 501 (1905).

If we turn to Plate 97, Part XXIII (*E. robusta*), the resemblance to *E. Kirtoniana* is so close that it cannot be ignored by the most casual observer. Compare the juvenile and mature leaves, the buds (strikingly similar). The fruits are less similar, but compare figs. 4c and 9 of Plate 123, and fig. 5 of Plate 98.

The similarity in the two barks has already been touched upon, and there is a good deal of similarity in the two timbers. The resemblance of *E. Kirtoniana* is apparently closer to *E. robusta* than to *E. resinifera*.

3. With *E. pellita* F.v.M.

" Differs in the shape and size of the calyx-tube and also in the fruits." (R. T. Baker.)

Plates 126 and 127 (Part XXX) should be compared. There is some affinity between the two species, but the affinity with *E. resinifera* would appear to be greater. At the same time we must bear in mind that our knowledge of *E. pellita* in the field is very much less than that of *E. resinifera*, and therefore in making comparisons between *E. pellita* and other species, we must be correspondingly cautious.

4. With *E. tereticornis* Sm.

" In botanical sequence it is placed between *E. tereticornis* Sm. and *E. rudis* Endl." (R. T. Baker). See also Mr. Petrie's remarks under *E. robusta*.

Consideration of the affinity with *E. tereticornis* may be deferred until that species is dealt with. *E. tereticornis* is, in the minds of some, a congeries of trees which may be distributed into several species. I will content myself with an expression of opinion that the resemblance is not close.

5. With *E. rudis* Endl.

This is only brought into review because of Mr. Baker's observation just quoted. *E. rudis* is the Swamp Gum of Western Australia. I think that the two species do not closely resemble each other, but perhaps we may defer further remarks until *E. rudis* is figured.

6. With *E. corymbosa* Sm.

Mr. Petrie has already drawn attention to some similarity between *E. Kirtoniana* and the Bloodwoods. This will be better understood when *E. corymbosa* is reached.

Explanation of Plates (120-123).

PLATE 120.

E. Baeuerleni F.v.M.

1*a*. Juvenile leaves; 1b, mature leaf; 1*c*, buds; 1*d*, anthers, front and back views; 1*e*, fruits; 1*f*, end view of fruit. Type. Sugar Loaf Mountain, near Braidwood, N.S.W. (W. Baeuerlen.)

2*a*. Narrow mature leaf; 2*b*, fruits, valves well exsert. Same locality and collector, but different date.

3*a*. Leaf; 3*b*, small fruits. Wentworth Falls, Blue Mountains, N.S.W. (W. Forsyth.)

E. scoparia Maiden.

4*a*. Juvenile leaves; 4*b*, juvenile leaves, shorter and broader,; 4*c*, mature leaves; 4*d*, buds; 4*e*, front and back views of anther; 4*f*, fruits. Type. Six miles from Wallangarra near the Queensland border. (J. L. Boorman.)

5*a*. Larger mature leaf; 5*b*, larger fruits. Six miles from Wallangarra. Collected in Queensland territory. (J. L. Boorman.)

E. Benthami Maiden and Cambage.

6*a*, 6*b*. Juvenile leaves; 6*c*, 6*d*, mature leaves; 6*e*, buds; 6*f*, front and back views of anthers; 6*g*, unripe fruits, showing marked rims; 6*h*, fruits not perfectly ripe; 6*i*, fully ripe fruits. Type. Banks of Nepean River, near Cobbity, N.S.W. (R. H. Cambage and J.H.M., June, 1913.)

7. Broader juvenile leaves. Same collectors and locality. November, 1914.

PLATE 121.

E. propinqua Deane and Maiden.

1*a*, 1*b*, 1*c*. Mature leaves; 1*d*, intermediate leaf approaching maturity; 1*e*, buds tending to be globular; 1*f*, pointed buds with long pedicels and broad peduncle; 1*g*, fruits; 1*h*, enlarged fruit, showing rim. Type. Dungog-Stroud Road, N.S.W. (A. Rudder.)

2*a*. Juvenile leaf, not quite in the earliest stage; 2*b*, immature fruits. Taree, N.S.W. (E. H. F. Swain.)

3*a*. Buds, some angled, 14 in the head; 3*b*, fruits with short valves. Beechwood, Rolland's Plains, Hastings River, N.S.W. (J. L. Boorman.)

4. Small fruits. Clarence River, N.S.W. (Collector unknown.)

5. Large mature leaf (the buds and fruits normal). Sandgate, Newcastle, N.S.W. (A. Murphy.)

6. Pointed buds, 7 in the head. One Tree Hill, Brisbane. (R. H. Cambage.)

7. Sessile fruits. Brisbane. (J. L. Boorman.)

8. Small fruits with valves exsert; pedicels long. Landsborough, North Coast Railway, Queensland (P. MacMahon.)

9. Back and front view of anthers.

E. punctata DC.

10*a*. Portion of twig, bearing mature leaves, and flower-buds; 10*b*, flower-bud with operculum lifted (enlarged); 10*c*, transverse section of a bud (much enlarged); 10*d*, very young fruit, with some stamens still persistent (much enlarged). All these are taken from the drawing of the type in "Mémoire sur la Famille des Myrtacées," par Aug. Pyr. De Candolle, Pl. 4.

11. Portion of Sieber's No. 623 (the type of *E. punctata*.)

12*a*. Buds; 12*b*, fruits with well exserted valves; 12*c*, smaller fruits. Hill Top, N.S.W. (H. Hammond Maiden.)

13. Juvenile leaf. Concord, Sydney. (J.H.M.)

14. Fruits, small and not domed, and with well-defined pedicels. Belmore, near Sydney. (W. Forsyth.)

(See also Plate 122.)

PLATE 122.

E. punctata DC.

(See also Plate 121).

1*a*. Mature leaf, yet broad; 1*b*, small fruits, domed. Concord, Sydney. (J. L. Boorman.)

2*a*. Sharply pointed buds; 2*b*, fruits with long pedicels. East bank of the Woronora River at Como, near Sydney. (J. H. Camfield.)

3*a*. Juvenile leaves; 3*b*, blunt buds; 3*c*, globular, domed fruits. Manly, Port Jackson. (J. L. Boorman.)

4. Fruits, immature. The Valley, near Springwood. (J.H.M.)

5. Juvenile leaf. Lowther-road, Kanimbla Valley, near Mount Victoria. (J.H.M.)

6*a*. Juvenile leaf; 6*b*, 6*c*, mature leaves; 6*d*, 6*e*, buds, with varying degrees of pointedness of opercula, and sharpness of rims; 6*f*, small fruits. Acacia Creek, Macpherson Range (New South Wales–Queensland Border). (J. L. Boorman.)

7. Fruits (domed). Woollooma Mount, Scone district. (H. S. White.)

8*a*. Pointed buds; 8*b*, 8*c*, front and back views of anthers; 8*d*, fruits. Port Jackson. (J.H.M.)

E. punctata DC. var. *grandiflora* Deane and Maiden.

9*a*. Mature leaf; 9*b*, buds; 9*c*, front and back views of anthers. Dungog district, N.S.W. (A. Rudder.) (See also Plate 123.)

PLATE 123.

E. punctata DC. var. *grandiflora* Deane and Maiden.

1. Fruits. Hill near Dungog. (A. Rudder.)

These Dungog specimens are the type of var. *grandiflora* (*major*).

2*a*. Unripe buds; 2*b*, fruits (rather small). Seven miles east of Dungog. (A. Rudder.) Type of *E. punctata* DC. var. *major* Baker and Smith.

3. Fruits, rather globular, but not perfectly ripe. Spit-road, Manly, Port Jackson. (J. L. Boorman.)

E. Kirtoniana F.v.M.

4*a*. Mature leaf; 4*b*, buds and flowers; 4*c*, fruits; 4*d*, 4*e*, front and back views of anthers. The Illawarra N.S.W. (Kirton.) Type from Herbarium, Melbourne.

5. Juvenile leaf. Green Point, near Gosford, N.S.W. (A. Murphy.)

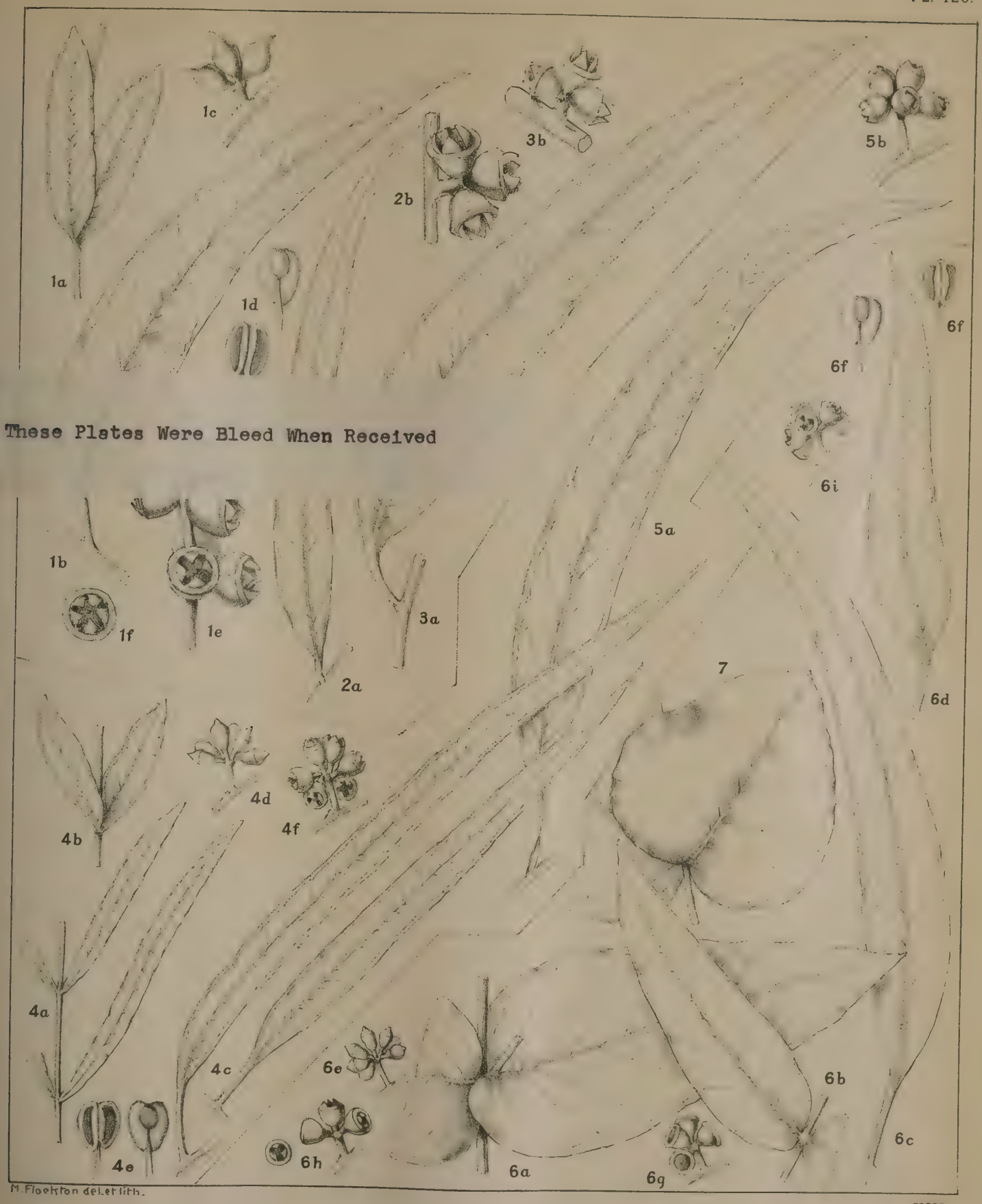
6*a*. Mature leaf; 6*b*, fruits. Near Woolgoolga, N.S.W. (E. H. F. Swain.)

7*a*. Mature leaf; 7*b*, very young fruit, showing long styles. Fraser Island, Queensland. (W. F. Petrie.)

8*a*. Mature leaf; 8*b*, buds. Bangalore, Mysore, South India.

9. Fruits, Lucknow, India.

Both 8 and 9 are from trees raised from seed sent by the late Baron von Mueller, of Melbourne.



These Plates Were Bleed When Received

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EUCALYPTUS BAEUERLENI F.v.M. (*1–3*)

E. SCOPARIA MAIDEN. (*4–5*)

E. BENTHAMI MAIDEN AND CAMBAGE. (*6–7*)

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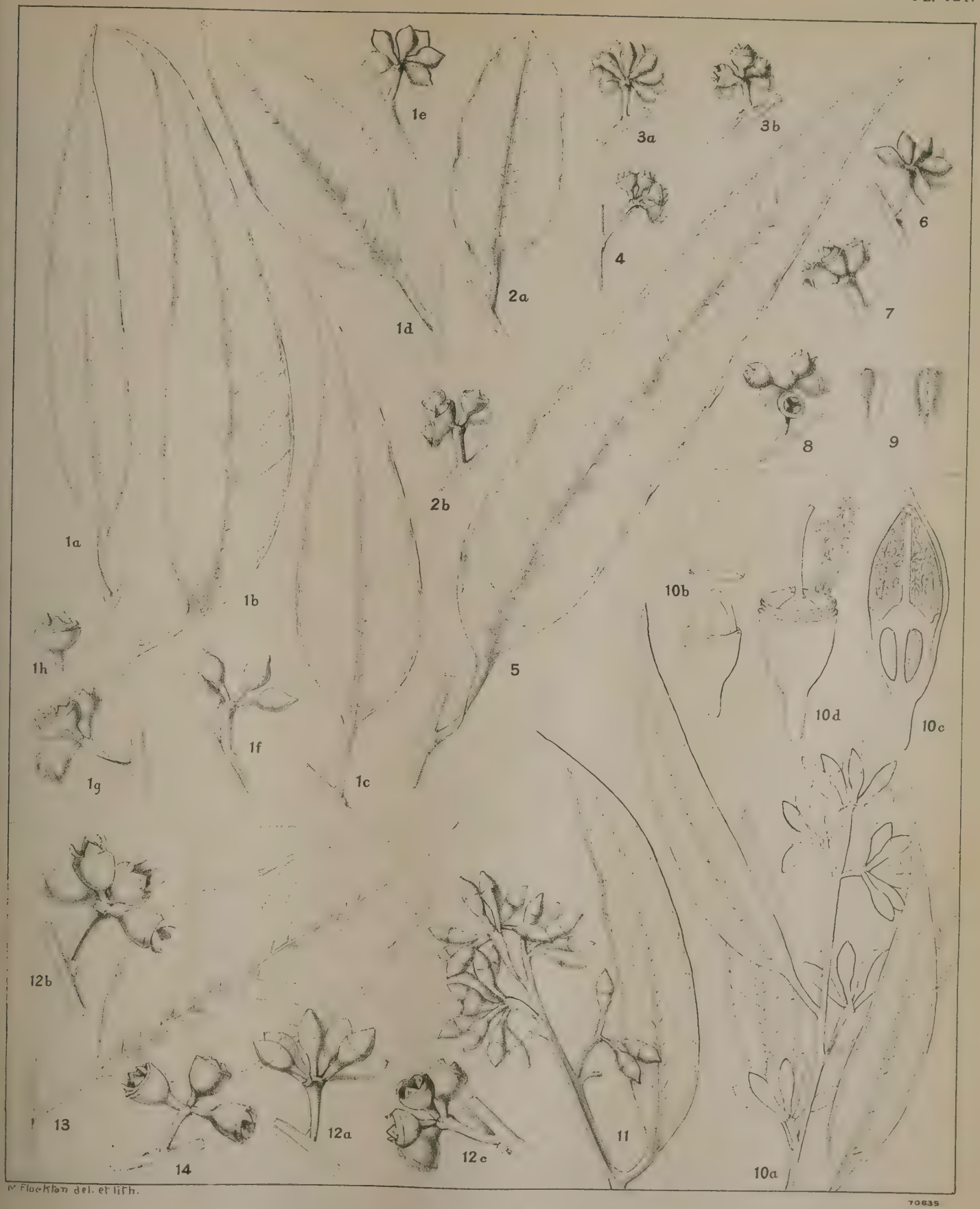

EUCALYPTUS PROPINQUA DEANE AND MAIDEN. (*1–9*)

E. PUNCTATA DC. (*10–14*). [See also Plate 122.]

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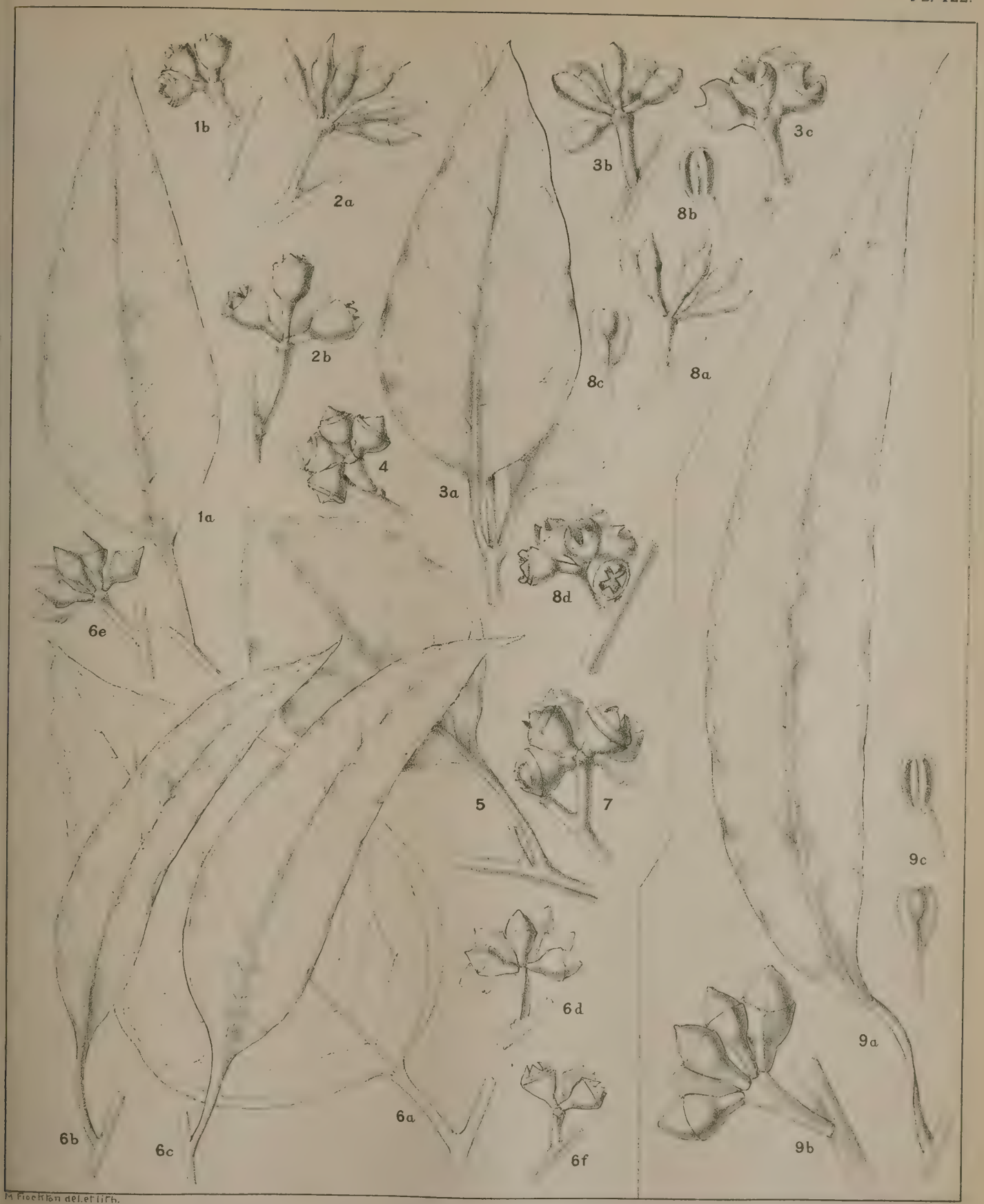

EUCALYPTUS PUNCTATA DC. *(1–8).* [See also Plate 121.]

E. PUNCTATA *var.* GRANDIFLORA DEANE AND MAIDEN. *(9).* [See also Plate 122.]

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EUCALYPTUS PUNCTATA DC. *var.* GRANDIFLORA DEANE AND MAIDEN (*1–3*). [See also Plate 122]

E. KIRTONIANA F.v.M. (*4–9*)

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A Critical Revision of the genus Eucalyptus

BY

J. H. MAIDEN, I.S.O., F.R.S., F.L.S.

(Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney).

Vol. III. Part 10.

Part XXX of the Complete Work.

(WITH FOUR PLATES.)

"Ages are spent in collecting materials, ages more in separating and combining them. Even when a system has been formed, there is still something to add, to alter, or to reject. Every generation enjoys the use of a vast hoard bequeathed to it by antiquity, and transmits that hoard, augmented by fresh acquisitions, to future ages. In these pursuits, therefore, the first speculators lie under great disadvantages, and, even when they fail, are entitled to praise."

MACAULAY'S "ESSAY ON MILTON."

PRICE TWO SHILLINGS AND SIXPENCE.

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1917.

DESCRIPTION.

CLV. E. resinifera Smith.

In *White's Voyage*—(1790).

Following is the original description. It is one of the earliest descriptions of a Eucalypt, and for that reason is especially interesting :—

Floribus pedunculatis, calyptrâ conicâ acutâ.

This is a very large and lofty tree, much exceeding the English Oak in size. The wood is extremely brittle, and, from the large quantity of resinous gum which it contains, is of little use but for firewood. *Of the leaves Mr. White has given no account, nor sent any specimens.* [The italics are mine.—J.H.M.] The flowers grow in little clusters, or rather umbels, about ten in each, and every flower has a proper partial footstalk, about a quarter of an inch in length, besides the general one. The general footstalk is remarkably compressed (anceps), and the partial ones are so in some degree. We have perceived nothing like bractea or floral leaves. The flowers appear to be yellowish, and are of a very singular structure. The calyx is hemispherical, perfectly entire in the margin, and afterwards becomes the capsule. On the top of the calyx, rather within the margin, stands a conical pointed calyptra, which is of the same colour as the calyx, and about as long as that and the footstalk taken together. This calyptra, which is the essential mark of the genus, and differs from that of the *Eucalyptus obliqua* of L'Héritier only in being conical and acute instead of hemispherical, is perfectly entire, and never splits or divides, though it is analogous to the corolla of other plants. When it is removed we perceive a great number of red stamina standing in a conical mass, which before the calyptra was taken off, were completely covered by it, and filled its inside. The antheræ are small and red. In the centre of these stamina is a single style of pointal rising a little above them, and terminated by a blunt stigma. The stamina are very resinous and aromatic. They are inserted into the margin of the calyx, so that the genus is properly called by Mr. L'Héritier in the class Icosandria. These stamina and style being removed, and the germen cut across about the middle of the calyx, it appears to be divided into three cells, and no more, as far as we have examined, each containing the rudiments of one or more seeds, for the number cannot with certainty be determined. Whether the calyptra in this species falls off, as in that described by Mr. L'Héritier, or be permanent, we cannot tell. From one specimen sent by Mr. White, the latter should seem to be the case; and that the calyx swells and rise around it nearly to the top, making a pear-shaped fruit, with the point of the calyptra sticking out at its apex; but as this only appears in a single flower, and none of the others are at all advanced towards ripening seed, the flower in question may possibly be in the morbid state, owing to the attacks of some insect. (See Fig. G.*) Future observations will determine this point. We have been the more diffuse in our description on account of the singularity of the genus, and the value of the plant. On making incisions in the trunk of this tree, large quantities of resinous juice are obtained, sometimes even more than 60 gallons from a single tree. When this juice is dried it becomes a very powerfully astringent gum-resin of a red colour, much resembling that in the shops known as "Kino," and, for all medical purposes, fully as efficacious. Mr. White administered it to a great number of patients in the dysentery which prevailed much soon after the landing of the convicts, and in no one instance found it to fail. This gum-resin dissolves almost entirely in spirits of wine, to which it gives a blood-red tincture. Water dissolves about one-fifth part only, and the watery solution is of a bright red. Both these solutions are powerfully astringent. The plate represents a portion of the bark of the *Eucalyptus resinifera*, with the fructification annexed.

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* Reproduced at 1b, Plate 124.

2. *E. hemilampra* F.v.M.

Following is the original description :—

Arborea, ramulis compresso-tetragonis, foliis alternis modice petiolatis curvato-lanceolatis sensim acuminatis pellucide punctatis subtilissime venosis supra nitentibus, subtus pallidioribus opacis, vena longitudinali amargine remotiuscula, umbellis, 5–7-floris axillaribus lateralibusque solitariis, pedunculo compresso petiolum aequante pedicellis angulosis longiore, calycis tubo late obconico paucicostato, operculo elongato conico acuto recto tubi longitudinem ter quaterve excedente ecostato, fructibus, subturbinatis quinqueloculatis, vertice convexis valvis semiexsertis, seminibus apteris.

Hab.—Ad rivulos torrentesque sylvaticos secus partes fluvii Brisbane superiores. Anth. Dec. Jan. Arbor procera, trunco, ramisque cinereis laevibus. Folia 4–5 poll longa, inferne ¾–1½″ lata. Pedunculi ½–1″ longi. Pedicelli calycis tubo modo longiores modo breviores. Operculum semunciale sordide flavidum. Filamenta albida ad ½″ longa. Fructus vix 3‴ longi apice non contracti.

E. tereticorni similis, foliis quoque *E. citriodoræ* (*Journ. Linn. Soc. iii*, 85 [1859].

The type from the Upper Brisbane, Queensland; specimens very close to the type are figured at 1–3, Plate 125.

E. hemilampra is a small fruited, long-operculumed form. I fail, as regards these two organs, to separate it from normal *E. resinifera*. The "egg-in-egg-cup" buds of *E. resinifera* and the angled calyces often seen in *E. resinifera* do not seem to be constant. The flowers are numerous, the buds and pedicels long; the buds are generally slender; suckers narrowish.

RANGE.

It is confined to the eastern, mainly coast, districts of New South Wales and Queensland. In the former State the most southern recorded locality (as I interpret the species) is the Picton district, and the most northerly locality is Fraser Island, opposite Maryborough, Queensland.

Some closely related forms, which have by some authors been referred to *E. resinifera*, and which I have referred to *E. pellita*, extend as far south as Northern Queensland, and as far west as the Blue Mountains of New South Wales.

Bentham gives the range in New South Wales as Port Jackson, and also as Parramatta and Cumberland (Parramatta and Port Jackson are in the County of Cumberland).

As regards Queensland, he gives Valleys of the Upper Brisbane (which is the form called by Mueller *E. hemilampra*) and Head of the Cape (River) for a specimen which I have not seen.

Mueller in "Eucalyptographia" says :—"In New South Wales and Queensland, but not extending far into the inland districts, traced northward hitherto to the vicinity of Rockingham Bay (Dallachy) (this is the type locality both for *E. pellita* F.v.M. and *E. spectabilis* F.v.M., J.H.M.), and the Daintree River (Fitzalan)."

It is probable that all North Queensland forms referred to *E. resinifera* really belong to *E. pellita*.

NEW SOUTH WALES.

Southern Districts.—Picton to Thirlmere. Valves more sunk than usual (J.H.M.).

(Compare also the Southern District forms referred to below, p. 216.)

Bankstown to Cabramatta (J. L. Boorman).

Sydney District.—Rocky Point Road, Kogarah; Oatley and Oatley West; Connell's Bay Road, Hurstville, &c.; Sutherland (J. H. Camfield).

Mrs. Macquarie's Chair (J. H. Camfield); Botanic Gardens and Inner Domain (J.H.M.); Field of Mars (J. J. Fletcher, R. H. Cambage, J.H.M.); Gladesville (J. L. Boorman); "Red Mahogany," Hunter's Hill (Rev. Dr. Woolls); Burwood (Rev. Dr. Woolls); Homebush (J.H.M.).

The following specimens were collected by one of Sir Joseph Banks' collectors in the Parramatta district:—"'Torumba'—From a young tree or bush on Marsden's Mill Farm. Operculum short. December, 29th 1807" (George Caley). "Mahogany"—Mr. Marsden's Mill Farm, March, 1805. This is "Torumba" (George Caley).

"Cotogurra." "Wet hollow, just below the Camp. 31st December, 1809. Cotogurra is only another name for 'Torumba'" (George Caley).

"Red Mahogany." "One of the largest trees in the district. Bark rough and persistent, very rough on the old trees, running right out on to the smaller branches. Young and medium trees are less rough, the branches often smooth and greenish, with a few scattered curly ribbons on the main branches. Found on shale and sandstone, but commoner on the shale." Near Berowra Bridge, Hornsby (now Asquith) (W. F. Blakely); near Hordern's Bridge, Waitara (W. F. Blakely).

Northern Districts.—Brisbane Water (W. D. Francis); Woy Woy (A. Murphy); Morrisset (J. L. Boorman); Alum Mt., Bulladelah (J.H.M.); Bulladelah (A. Rudder); "Red Mahogany," Port Macquarie (G. R. Brown); near Woolgoolga (E. H. F. Swain); Bucca Creek, near Coff's Harbour, typical *E. hemilampra* (J. L. Boorman); Clarence River (Forest Ranger Huxham); Mullumbimby, Brunswick River (W. Baeuerlen); Tintenbar, Richmond River (W. Baeuerlen); Drake (E. C. Andrews); Acacia Creek, Macpherson Range (W. Dunn).

QUEENSLAND.

"*Eucalyptus hemilampra* n.sp., Vallies of the Upper Brisbane, December, 1856. Dr. M. (Mueller)."

The above is a copy of a label in the Melbourne Herbarium, and the following addition is also in Mueller's handwriting :—

"E. saligna var. (Mueller).

"E. resinifera var. grandiflora (Bentham)."

"Jimmy Low," Maroochie (collector of F. M. Bailey) ; "Jimmy Low," Eight-mile Plains, Brisbane (J. L. Boorman); Woodford (R. N. Jolly); "Red Stringybark," Landsborough (P. MacMahon); "Red Stringybark," Fraser Island, Maryborough (W. R. Petrie).

AFFINITIES.

E. resinifera in its young state has the bark flaky-stringy, and eventually fibrous.

The young leaves have the venation somewhat spreading; later on the venation is more parallel.

In both these respects *E. resinifera* shows its intermediate character between the Bloodwoods and the Stringybarks.

1. With *E. punctata* DC.

From the timber point of view this species is closest to *E. resinifera*. I have dealt with the affinities of the two species under *E. punctata*, Part XXIX, p. 198.

2. With *E. Kirtoniana* F.v.M.

The affinities are interesting, and I have referred to them under Part XXIX, p. 203.

3. With *E. siderophloia* Benth. var. *rostrata*.

"When the operculum (of *E. resinifera*) is long, the buds resemble those of *E. siderophloia* var. *rostrata*, and of *E. tereticornis*, but the venation of the foliage and other characters are quite different." (B.Fl. iii, 246.)

The comparison will be understood by turning to Plate 47 (Part X), 20*a* and 27, for buds. The resemblance of the fruits is less close.

E. siderophloia is an Ironbark, *E. resinifera* a Mahogany. While the two timbers may resemble each other a good deal, the expert can readily separate them through the greater tensile strength of the former.

4. With *E. saligna* Sm.

E. resinifera "is allied in the fruit and foliage to *E. saligna*, differing chiefly in the pedicellate flowers and large operculum" (B.Fl. iii, 246). The plates of *E. saligna* (Plates 99 and 100) Part XXIII can be referred to. The buds of *E. saligna* have usually shorter opercula and they are often sessile. The fruits of *E. saligna* have a thin rim, and the finger-nail can be passed between it and the valves.

E. saligna is a smooth-barked, straight tree of gullies; *E. resinifera* is a fibrous-barked tree of drier situations, shorter in the trunk, and with a larger head.

5. With *E. Stuartiana* F.v.M.

E. resinifera is allied "in the fruit to *E. Stuartiana*, from which it is readily distinguished by the venation of the leaves as well as by the operculum." (B.Fl. iii, 246.)

The plates of *E. Stuartiana* (Plates 101 and 102, Part XXIV) can be referred to. The juvenile leaves of that species are sessile or stem-clasping, and almost circular, the opercula are short, often hemispherical; the fruit is less domed.

E. Stuartiana occurs at higher elevations and not in the coast districts, which *E. resinifera* frequents. *E. Stuartiana* has a sub-fibrous white bark like a shorn sheep; that of *E. resinifera* is very different. *E. Stuartiana* has a pale-coloured weak, non-durable timber, the antithesis of *E. resinifera* in these respects.

6. With *E. tereticornis* Sm.

See Bentham's remarks, quoted under *E. siderophloia* var. *rostrata*.

It has already been hinted (p. 208) that in the operculum *E. resinifera* and *E. tereticornis* may resemble each other a good deal, but their relations will be better understood when *E. tereticornis* is dealt with in Part XXXI.

E. tereticornis is a somewhat erect smooth-barked species; *E. resinifera* has a more spreading head, and is fibrous-barked. The timber of *E. tereticornis* is more interlocked.

DESCRIPTION.

CLVI. E. pellita F.v.M.

In *Fragmenta* iv, 159 (1864).

Following is a translation of the original :—

A tree with strong angular branchlets, leaves alternate, ovate-lanceolate, gradually and for a great part of the leaf acuminate, of different colours on both sides, rather thick, coriaceous, imperforate, moderately petiolate, abundantly penniveined, the veins being fine, the peripheral vein close to the margin, umbels 3–5 flowered, paniculate, the fruit-bearing pedicels thick and angular and several times shorter than the fruit and two-edged peduncle, the fruit semi-ovate, partly angled, marked with a rather broad groove on the outer side near the vertex, 3–5 celled, valves acute and distinctly exsert, seeds winged.

Rockingham Bay, Queensland (*Dallachy*).

A tree 40–50 feet high, branches smooth, strong. Leaves 4–6 inches long, 1½–2 inches broad, paler on the under side, slightly inæquilateral at the base; the point often curved. Flowers unknown. Fruit-bearing peduncles 8–10 lines long, about 2 lines broad. The fruit, not including the tips of the valves, is 4–5 lines long, slightly sunk about the vertex; the exsert parts of the valves 1½–2 lines long. The seeds rather small, the fertile ones broader than the sterile ones.

It will be observed that the buds, flowers and fruits were unknown.

Bentham, (B.Fl. iii, 246) describes the species in English, and gives the locality Rockhampton by mistake. It should be Rockingham Bay, which is north of Hinchinbrook Island, in about 18° South latitude. Rockhampton is approximately 23·5°.

E. pellita has hemispherical or conical overhanging opercula.

SYNONYM.

1. *E. spectabilis* F.v.M.

Following is a translation of the original :—

A glabrous tree, with robust branches compressed tetragonously upwards, the leaves large and almost ovate, here and there lanceolate, often acuminate, the same colour on both sides, the petioles somewhat long and broad, alternate and rather thick, coriaceous, imperforate, thickly and distinctly penniveined, the peripheral vein rather far from the margin, the axillary and lateral peduncles solitary, 4–7 flowered; two-edged, shorter than, or almost the same length as the petiole, the calyx-tube almost turbinate, narrowed into a slightly longer thick angular pedicel, almost the same length as the operculum, the operculum semi-globose below and umbonate above, entirely without ribs, stamens longer than the style, anthers ellipsoid, fruit 4-celled.

From Rockingham Bay, Queensland (*Dallachy*).

A small or medium tree. Leaves mostly 6–7 inches long, 2–3½ inches broad, shining on the upper side, almost opaque on the under, more inæquilateral than those of most of the species. Peduncles about 1 inch long and 3 lines broad. The buds, including the pedicel, measure about 1 inch. The calyx-tube is more or less angled. The operculum about ½ an inch broad, stamens pale yellow, inflected in the bud before expansion, and not straight like those of *E. cornuta*. Anthers scarcely ½ line long. Style strong, about 3 lines long, thickened at the base. Ripe fruits not known. Its position is near that of *E. marginata*. (*Fragm.* v, 45.)

It will be observed that the types of *E. pellita* and *E. spectabilis* came from the same locality.

Thus in the wet and hot regions of Rockingham Bay the leaves assume a broad, almost oval form of nearly equal colour on both sides and of thicker consistence, while the lid of the calyx becomes suddenly contracted from a semi-globular base; this variety was described as *E. spectabilis*. ("Eucalyptographia," under *E. resinifera*.)

RANGE.

So far as we know at present, the typical form of this species is confined to the coastal districts and coastal mountain ranges of Northern Queensland, between Townsville and Cairns. The attention of observers is invited to it.

In New South Wales we have a number of forms intermediate between it and *E. resinifera*.

Typical or nearly typical forms.

"Woolly Bark," "Mahogany," "Scrub Bloodwood." Tall straight tree, with spreading branches. Timber red, with heavy sap. Growing frequently on Coast Range, north of Townsville, principally on scrub fringes (H. W. Mocatta, Queensland Forest Department, No. 11).

"Scrub edges, west of Macalister Range, North Queensland. In appearance it much resembles *E. robusta*" (R. N. Jolly). Same as Mr. Mocatta's.

Rockingham Bay (Dallachy). Portion of type. In buds and flowers only.

In the "Report on Expedition to the Bellenden Ker Range," by Mr. A. Meston, 1904 (Report on the Vegetation by Mr. F. M. Bailey at p. 9), the record *E. robusta* Sm. should be *E. pellita* F.v.M., a mistake easily made. Kuranda (Miss Edwards).

Large tree; common in open or in forest; 1,000 feet, Kuranda (Miss L. S. Gibbs, F.L.S., No. 6340).

Comparatively narrow leaves. Barron River, near Cairns (Collector of Mueller).

Comparatively narrow leaves, red wood, short stringy bark. Near Mr. John Hill's, east of Inlet, Cairns, North Queensland (R. H. Cambage, No. 3837).

Fibrous bark, large tree, red wood. At 1,100 feet, Kuranda, North Queensland (R. H. Cambage, No. 3904). This specimen has thinner foliage, evidently grown more or less under shade.

Forms intermediate between *E. pellita* and *E. resinifera*.

They are figured on Plate 125 (figures 4–10) and Plate 126 (figures 1–3). Comparison of them with the figures of *E. resinifera*, Plate 124, and *E. pellita*, Plates 126 and 127, will show that they possess affinities to both species and particularly to the latter.

These forms are confined to New South Wales so far as we know at present, and I will divide them into Coast Districts and Blue Mountains. Like *E. pellita*, these intermediate forms require the increased attention of observers.

Southern Coastal Districts.—Buds with rugose opercula, not smooth as in *E. resinifera*, and buds and fruits varying from intermediate to large and very large in size (see figures).

Largish fruits. Currawang Creek, South Coast Road (W. Baeuerlen).

"Mahogany," Termeil (R. H. Cambage).

Blunt to pointed opercula, short stalks, sessile fruits. On sandy soil, Milton (R. H. Cambage).

Conjola, prominent band to fruit (W. Heron).

Bundanoon (W. Greenwood).

Top of Barrengarry Mountain (R. H. Cambage and J.H.M.). (The two last localities are just on the tableland.)

Northern Coastal Districts.—Very large fruits, blunt to pointed buds, nearly sessile to long stalks. Manly Swamps, just north of Sydney (Rev. Dr. Woolls, A. A. Hamilton).

5–6 feet high, yet flowering freely (see figure 10, Plate 125). Bark fibrous. On the driest, hungriest, wind-swept sandstone at the Trig. Station, 374 feet. First Point, Kincumber (R. H. Cambage and J.H.M.).

The following specimens are practically the same as those from Manly Swamps :—

"Mountain Mahogany," Hogan's Brush (W. A. W. de Beuzeville); Narara (D. Coull).

Very large, shiny, handsome fruits, conical buds, overlapping opercula. Wyong (J. L. Boorman).

"Bastard Mahogany," Bungwahl (A. Rudder).

Blue Mountains.—The following have small or intermediate fruits with rugose opercula.

Lower Kurrajong, one of the lower slopes to the Blue Mountains (J.H.M.).

Glenbrook. Fruits slightly stalked, calyx tube with a raised ridge (J.H.M.).

Lapstone Hill to Springwood. Fruits sessile to hardly stalked (R. H. Cambage and J.H.M.).

Springwood. Sessile to pedunculate (J. L. Boorman).

Faulconbridge (J.H.M.). Operculum hemispherical to bluntly conical. Fruits sessile and of same size as *resinifera*.

Springwood. Fruits larger than any other of the Blue Mountains specimens, pyriform, shortly stalked valves, little protruded. Perhaps show hybridism. (J. H. Camfield.)

AFFINITIES.

1. With *E. botryoides* Sm.

The species (*pellita*) as observed by F. Mueller, resembles *E. botryoides*, but differs in the larger, especially broader flowers, in the conical ovary, and in the shape of the fruit. (B.Fl. iii, 246.)

Mueller later ("Eucalyptographia") compares *E. resinifera* with *E. botryoides*, and, under *E. resinifera*, includes *E. pellita* as a tropical luxuriant form.

For figures of *E. botryoides*, Part XXIII, Plates 98 and 99, may be referred to, and it will be seen that, except in the intermediate leaves of *E. botryoides*, there is no important similarity to *E. pellita*. The resemblance is, however, closer in the case of those transit forms between *E. pellita* and *E. resinifera*.

2. With *E. saligna* Sm.

It is, however, very closely allied to *E. saligna*, ... differing chiefly in the size of its leaves, flowers, and fruit. (B.Fl. iii, 246.)

The affinity to *E. saligna* is even less close than to *E. botryoides*, as will be seen by study of Plates 99 and 100, Part XXIII. *E. saligna* is a smooth-barked species, with the exception of a little rough bark at the butt.

3. With *E. resinifera* Sm.

It (*E. pellita*) is, however, very closely allied to . . . . *E. resinifera*, differing chiefly in the size of its leaves, flowers, and fruit, and should perhaps include the var. *grandiflora*, which I have referred to the latter. (B.Fl. iii, 246.)

The var. *grandiflora* may be dropped, after what I have said at p. 209.

Another variety with more elongated leaves, partially paniculated flowers and larger fruits was rendered known as *E. pellita*; but augmented material, since accumulated, has proved also this as a tropical luxuriant form referable to *E. resinifera*. ("Eucalyptographia," Part i, under *E. resinifera*.)

I have not got an entire series of specimens of *E. pellita*, but from examination of the broad mature leaf of the type and also the juvenile leaf of Mr. Cambage's 3904 from Kuranda, it is obvious that the juvenile leaf of this species is broadish, probably nearly as broad as long. The *E. resinifera* or assumed *resinifera-pellita* juvenile leaves

figured, *c.g.*, Plate 124 (Fig. 5, not in the youngest state), Plate 125 (Figs. 3*a* and 9), are on the narrow side. So that on this evidence alone (width of juvenile leaves) I would keep *E. resinifera* and *E. pellita* apart. They are pairs of species, such as we have many in Eucalypts. That they run into each other is admitted, but if we make them conspecific we are deprived of the classificatory value of juvenile leaves.

In the juvenile leaves of the Blue Mountains (N.S.W.) specimens, I see no difference from those of normal *E. resinifera*.

I do not call these specimens (Blue Mountains) typical, but intermediate between *E. resinifera* and *E. pellita*.

Another affinity between the two species is the angle of the calyx-tube, common to both typical *resinifera* and *pellita*, but apparently absent from that form of *resinifera* known as *E. hemilampra*.

4. With *E. robusta* Sm.

The variety *pellita* of *E. resinifera* has the large flowers and broad leaves of *E. robusta*, but the proportionately short fruit with exserted and mostly free, erect and acute valves of the former. ("Eucalyptographia," Part vii, under *E. robusta*.)

Apparently through an oversight, Bentham omitted to draw attention to the affinities to *E. robusta*, while not omitting those of less closely related species.

Bailey (I repeat reasonably) confused Bellenden Ker *robusta* material with *pellita*.

Note that at p. 215 Mr. R. N. Jolly, Director of Forests, Queensland, speaking of a specimen of *E. pellita* says : "In appearance it much resembles *E. robusta*."

Mr. Jolly's note refers to the general appearance of the two trees, but let us compare the figures of *E. robusta* in Plates 97 and 98, Part XXIII, with our figures of *E. pellita*. The resemblance would strike a superficial observer. Take the broad juvenile leaf (4*a*, Plate 97) and intermediate one (6*a*) of *E. robusta*. Compare also the flower-buds. The resemblance of the fruits of the two species is less strong, but the immature fruits of 1*b*, Plate 127 (*E. pellita*) show resemblance to some of those of *E. robusta*.

DESCRIPTION.

CLVII. E. brachyandra F.v.M.

In *Journ. Linn. Soc.* iii, 97 (1859).

Following is a translation of the original :—

A small tree with angular branchlets, leaves alternate or opposite, moderately petiolate, papery, ovate or broadly oblong, obtuse, opaque, slightly penniveined, small veins inconspicuous, imperforate, paler on the under side, peripheral vein somewhat close to the margin, umbels 3–5 flowered, gathered together in a terminal panicle, peduncles angular, pedicels thin, shorter than the calyx or of the same length; operculum conical-hemispherical, shorter than the tube, filaments very short, anthers didymous, fruits minute, campanulate, exangular, without ribs, 3–4 celled, concave at the vertex, valves somewhat included, very short, seeds winged.

Habitat.—In the rocky slopes in the upper parts of the Victoria River. Flowering in the early spring.

A tree-like shrub, leaves for the most part 1½–3 inches long, ⅔–1½ inches broad, obtuse, somewhat acute at the very base. The flower-bearing calyx slightly exceeding 1 line in length, the fruit-bearing calyx a line and a half long or slightly longer. Stamens at the most 1 line long. The operculum only seen in the young buds.

The species is remarkable for the smallness of the flowers and fruit.

Bentham's description in B.Fl. iii, 223, is as follows :—

E. brachyandra, F. Muell. in Journ. Linn. Soc. iii, 97. A tall shrub or small tree. Leaves ovate or oblong, on long petioles, very obtuse, 2 to 4 inches long, thick with numerous parallel very diverging veins, fine but not very close. Flowers not seen. Umbels several together in a short panicle. Calyx after flowering very small, ovoid globose, with a few very short stamens with minute globose anthers remaining about the orifice.

Fruit urceolate-globose, scarcely more than 1 line long, the rim thin, the capsule sunk.

So little is known of this species that the following unpublished notes by Mr. W. V. Fitzgerald will be acceptable :—

"A tree of 25–30 feet; trunk crooked, often piped, up to 10 feet; diameter to 9 inches; bark grey, rough, longitudinally fissured, persistent on trunk and limbs; timber red, hard and tough, filaments white."

E. brachyandra is a rare tropical species, the morphology of which has not been completely worked out.

The stamens are in a close double row, the outer row being the longer.

A small, almost leafy bract can be seen under each umbel when the buds are in quite a young state.

Its fruits are small and of a papery texture, with a thin rim, and with the tips of the valves well sunk.

But the most interesting point in regard to this species appears to be in connection with the operculum.

The buds have a nearly hemispherical operculum. The operculum has an *outer* membrane (double operculum) which is circumsciss at the line of demarcation of operculum and calyx tube. This membrane breaks up into pieces which sometimes are remarkably symmetrical in size and shape. Occasionally they show a slight thickening which gives them almost a keeled appearance. See Fig. 6*e* of Plate 127.

I will later on draw attention to this double operculum, which occurs much more commonly in the genus than has been hitherto recorded.

In the present species, the membranous scales or pieces of the outer operculum appear to be placed at fairly equal distances around the calyx rim, and when seen through a lens the very smallest buds show them still distinct from each other although sometimes touching; in no instance have they been noticed united so as to form a whole operculum. Where the calyx is slightly ribbed the scales are found on the top of the rib.

Mr. W. F. Blakely informs me that he has seen the outer operculum of each individual bud entire in the very young state, and this is not improbable, but I could not be certain with these minute objects, and desire to obtain more material; the matter may well be reconsidered when this is available, and comparative observations are made with other species.

The matter, of course, raises the question as to the morphological equivalents of these scales or pieces of the outer operculum—whether they represent sepals.

RANGE.

Until a few years ago this species had not, so far as I am aware, been found since Mueller, on Gregory's Expedition of 1856, found it on "rocky declivities of the Upper Victoria River" (Northern Territory).

Mr. W. V. Fitzgerald collected it in North-West Australia in 1905 in the following localities. Artesian and Edkins Ranges; Hills along Denham and King Rivers; Dillen's Springs (Sunday Island). Always amongst sandstone and quartzite. These discoveries extend its range considerably, and add a species to the flora of Western Australia. Dr. Herbert Basedow has (May, 1916) collected it in ripe fruit also from Sunday Island (his 115).

AFFINITIES.

It naturally occurs to one to compare this species with other small fruited species, e.g., *Raveretiana* F.v.M., *Howittiana* F.v.M.

1. With *E. Raveretiana* F.v.M.

Compare Plate 53, Part XII. *E. Raveretiana* is a large Box-tree; *E. brachyandra* is described as a small tree with grey fissured bark; we do not know if they tend to approximate to each other in these respects, but the localities known for both are very few.

The mature leaves of *E. Raveretiana* are narrow rather than broad, the fruits have the valves exsert, and the opercula are much more pointed.

2. With *E. Howittiana* F.v.M.

This is another small-fruited species; the fruit is, however, more spherical and the leaves more lanceolate. It is also a very large tree, and I will again make comparisons when *E. Howittiana* is figured. The anther-cells of *E. Howittiana* are more parallel than those of *E. brachyandra.*

3. With *E. populifolia* Hook. f.

This species has sometimes the fruits so small, particularly in Queensland, that the similarity may be noted. The leaves are usually shiny, while those of *E. brachyandra* are dull.

4. With *E. melanophloia* F.v.M.

In shape of leaves, and in anthers, there is a certain amount of similarity between *E. brachyandra* and some specimens of *E. melanophloia* from North-Western Australia. But the fruits of the latter species are larger and usually, though not invariably, opposite and sessile.

5. With *E. Brownii* Maiden and Cambage, *Proc. Roy. Soc. N.S.W.* xlvii, 215 (1913), which has sometimes fruits as small and of very nearly the same shape as those of *E. brachyandra,* but the mature leaves of the former are long and narrow.

6. With *E. Spenceriana* Maiden.

But its true affinity lies, it appears to me, with those species with papery fruits, which have thin rims and which have the tips of the valves well sunk. The group is Angophoroid to some extent, and includes *E. tesselaris* F.v.M., *E. papuana* F.v.M., *E. clavigera* A. Cunn., *E. aspera* F.v.M., *E. Spenceriana* Maiden, the latest described member of the group, seems in some respects (leaves and inflorescence) nearest to *E. brachyandra,* but the members of the group run into each other in a most intricate manner.

Explanation of Plates (124–127).

PLATE 124.

E. resinifera Sm.

(1–6 may be accepted as typical.)

1*a*. Buds; 1*b*, bark; being reproductions of figures of "Red Gum tree (*Eucalyptus resinifera*)" in White's *Journal of a Voyage to New South Wales*, p. 231. (1790.)

I would suggest that the drawing of the bark may be *Angophora lanceolata*, while *E. tereticornis* Sm. is less likely. The buds depicted resemble those of *E. resinifera* as well as *E. tereticornis*.

2. Leaf, buds and flowers. "*Eucalyptus resinifera*, Red Gum Eucalyptus." From Smith's "Exotic Botany," t. 84 (1805). This is quoted by Bentham as *E. resinifera* and may be accepted as the type.

3. Cluster of young buds. Bankstown to Cabramatta, near Sydney. (J. L. Boorman.) Note the egg-in-egg-cup appearance, which is well shown in 2.

4*a*. Mature leaf; 4*b*, plump buds, nine in the head, the operculum quite smooth; 4*c*, front and back views of anther; 4*d*, fruits. Oatley, George's River, near Sydney. (J. H. Camfield.)

5. Intermediate leaf. Berowra Bridge, near Hawkesbury River. (J.H.M.)

6. Buds. Note the angled calyx, and the egg-in-egg-cup appearance. Glenbrook, Blue Mountains. (J.H.M.)

[7–9 include var. *grandiflora* Benth., an unfortunate name, which includes *E. hemilampra* F.v.M. (a small-fruited form), and I cannot separate it from typical *E. resinifera* by any marked character.]

7. "*Euc. resinifera*. Resinous Eucalyptus," from Andrews' "Botanical Repository," Vol. 6, Plate 400. In B.Fl. iii, 246, Bentham quotes this as his var. *grandiflora*, but the buds are scarcely "ovoid," although they correspond to the remainder of the description . . . . . "the operculum broad and thick at the base, with a rather long beak or gradually tapering." The name *grandiflora* should be abandoned as misleading.

8*a*, 8*b*. Mature leaves; 8*c*, buds (there is no abrupt line of demarcation between calyx-tube and operculum); 8*d*, fruits. Bankstown to Cabramatta. (J. L. Boorman.)

9*a*. Buds; 9*b*, front and back views of anthers; 9*c*, fruits. (Caley, 1809.)

PLATE 125.

[Nos. 1–3 are a continuation of Nos. 7–9 of Plate 124.]

E. resinifera Sm.

1. Juvenile leaf. Bankstown to Cabramatta. (J. L. Boorman.)

2. Buds. Tintenbar, Richmond River, N.S.W. (W. Baeuerlen, No. 956.)

3*a*. Juvenile leaves; 3*b*, mature leaf; 3*c*, buds; 3*d*, front and 3*e*, back view of anthers; 3*f*, fruits. Bucca Creek, near Coff's Harbour, N.S.W. (J. L. Boorman.) Compare 3*a* with 9.

E. pellita F.v.M. (in part).

(Nos. 4–10 are provisionally submitted as coming under *E. pellita* F.v.M., or, perhaps more accurately, transit forms between that species and *E. resinifera*. These forms, together with figs. 1–3 of Plate 126, seem to be transit forms between the *E. resinifera* of Plate 124, and typical *E. pellita* of Fig. 4, Plate 126.)

4. Buds, with pointed opercula. Currawang Creek, South Coast, N.S.W. (W. Baeuerlen).

5*a*. Mature leaf; 5*b*, buds, with bluntly conical opercula; 5*c*, fruits. Milton, N.S.W. (R. H. Cambage, No. 4074.)

6*a*. Ovoid buds; 6*b*, unripe fruits. Top of Barrengarry Mountain, near Moss Vale. (R. H. Cambage and J.H.M.)

7*a*. Buds with rounded opercula; 7*b*, buds with conoid opercula; 7*c*, fruits; 7*d*, fruit, viewed from the top; 7*e*, leaf. Springwood. (J. L. Boorman.)

PLATE 125—*continued.*

E. pellita F.v.M. (in part)—*continued.*

8*a*. Buds, nearly sessile; 8*b*, sessile, angled fruits. Faulconbridge. (J.H.M.) N.B.—The Springwood and Faulconbridge localities are a mile apart and practically identical.

9. Juvenile leaf. Close to the 40-mile post, near Springwood. (R. H. Cambage and J.H.M.). Compare with 3*a*.

10*a*. Intermediate leaf; 10*b*, buds. (Note the peculiar appearance owing to shrivelling, the top of the operculum not being distended by the bent filaments); 10*c*, front and back views of anthers. First Point, Kincumber, N.S.W. (R. H. Cambage and J.H.M.) See also Plate 126.

PLATE 126.

E. pellita F.v.M.

(1–3, continuation of transit forms from Plate 125.)

1*a*. Mature leaf, moderately narrow; 1*b*, mature leaf, broad; 1*c*, sessile fruits; 1*d*, larger fruits with very short pedicels; 1*e*, fruits with longer pedicels. First Point, Kincumber. (R. H. Cambage and J.H.M.) See also Plate 125.

2*a*, 2*b*. Mature leaves of varying width; 2*c*, buds with overhanging opercula. "Bastard Mahogany." Bungwahl, N.S.W. (Augustus Rudder.)

3*a*. Buds in threes, opercula sharp-pointed; 3*b*, front and back views of anther; 3*c*, angled fruits, large in size. Wyong, N.S.W. (J. L. Boorman.)

E. pellita F.v.M. (Type.)

4*a*. Mature leaf; 4*b*, buds; 4*c*, front views of anthers; 4*d*, back view of anthers. Rockingham Bay, Queensland. (J. Dallachy.) Type of *E. pellita* F.v.M.

PLATE 127.

E. pellita F.v.M.

1*a*. Mature leaf, thick, shiny, with raised midrib on the under surface; 1*b*, fruits, tips of valves sunk or flush with edge of rim; 1*c*, 1*d*, fruits with valves well exsert.

2*a*. Juvenile leaf, thin, pale under-surface, venation marked. Kuranda, North Queensland, at 1,100 feet. (R. H. Cambage, No. 3904.) N.B.—When the leaf becomes mature the venation consists of fine, nearly parallel veins.

3*a*. Mature leaf, comparatively narrow; 3*b*, buds, comparatively small. Kuranda, at 1,000 feet. (Miss Edith Edwards, also Miss L. S. Gibbs, F.L.S.)

4*a* and 4*b*, the same fruit, in elevation and plan.

5*a* and 5*b*, the same fruit, in elevation and plan.

It will be noticed that in 4*a* we have a very marked band as the curve of the band narrows towards the top. In 5*a* the contrary is the case. It was at one time thought that perhaps here we might have a permanent character to separate large fruited forms of *E. resinifera* from *E. pellita*, which is normally large-fruited. It, however, was found that the two forms ran into each other.

E. brachyandra F.v.M.

6*a*. Twig with mature leaves and flowers; 6*e*, buds; 6*c*, fruits, natural size; 6*d*, fruits, enlarged, showing the sunken valves and thin rim; 6*e*, buds, enlarged; 6*f*, front and back views of anthers. Artesian Range, Kimberley, North-West Australia. (W. V. Fitzgerald.)

The scales shown at 6*e* cover the operculum. In some cases they are uniform in size and show a keel or external rib. They are, however, usually irregular in shape and are doubtless the five portions of an outer or double operculum covering a single bud, and have become torn by the growth of the bud.

The following species of Eucalyptus are illustrated in my "Forest Flora of New South Wales"* with larger twigs than is possible in the present work; photographs of the trees are also introduced wherever possible. Details in regard to their economic value, &c., are given at length in that work, which is a popular one. The number of the Part of the Forest Flora is given in brackets :—

acacioides A. Cunn (xlviii).
acmenioides Schauer (xxxii).
affinis Deane and Maiden (lvi).
amygdalina Labill. (xvi).
Andrewsi Maiden (xxi).
Baileyana F.v.M. (xxxv).
Baueriana Schauer (lvii).
Baueriana Schauer, var. *conica* Maiden (lviii).
Behriana F.v.M. (xlvi).
bicolor A. Cunn. (xliv).
Boormani Deane and Maiden (xlv).
Bosistoana F.v.M. (xliii).
Caleyi Maiden (lv).
capitellata Sm. (xxviii).
Consideniana Maiden (xxxvi).
coriacea A. Cunn. (xv).
corymbosa Sm. (xii).
crebra F.v.M. (liii).
dives Schauer (xix).
fruticetorum F.v.M. (xlii).
gigantea Hook. f. (li).
goniocalyx F.v.M. (v).
hæmastoma Sm. (xxxvii).
hemiphloia F.v.M. (vi).
longifolia Link and Otto (ii).
Luehmanniana F.v.M. (xxvi).
macrorrhyncha F.v.M. (xxvii).
maculata Hook. (vii).
melanophloia F.v.M. (liv).
melliodora A. Cunn. (ix).
microcorys F.v.M. (xxxviii).
microtheca F.v.M. (lii).
numerosa Maiden (xvii).
obliqua L'Hérit. (xxii).
ochrophloia F.v.M. (l).
odorata Behr and Schlechtendal (xli).
oleosa F.v.M (lx).
paniculata Sm. (viii).
pilularis Sm. (xxxi).
piperita Sm. (xxxiii).
Planchoniana F.v.M. (xxiv).
polyanthemos Schauer (lix).
populifolia Hook. (xlvii).
punctata DC. (x).
regnans F.v.M. (xviii).
resinifera Sm. (iii).
saligna Sm. (iv).
siderophloia Benth. (xxxix).
sideroxylon A. Cunn. (xiii).
Sieberiana F.v.M. (xxxiv).
stellulata Sieb. (xiv).
tereticornis Sm. (xi).
virgata Sieb. (xxv).
vitrea R. T. Baker (xxiii).

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* Government Printer, Sydney. 4to. Price 1s. per part (10s. per 12 parts); each part containing 4 plates and other illustrations.

Sydney: William Applegate Gullick, Government Printer.—1917.

EUCALYPTUS RESINIFERA Sm. [See Plate 125.]

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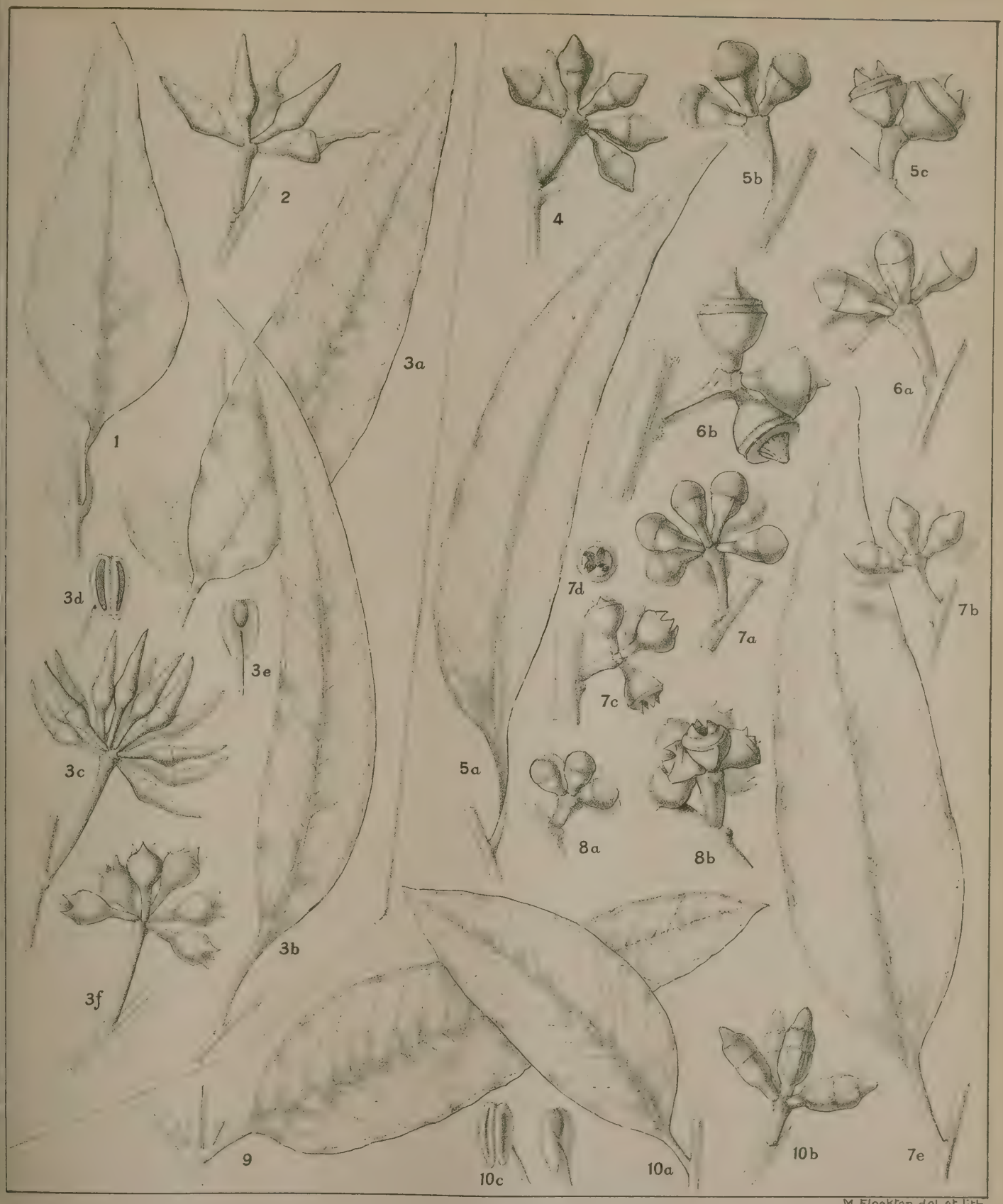

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EUCALYPTUS RESINIFERA SM. (*1–3*). [See Plate 124]

E. PELLITA F v.M. (*4–10*). Transit forms from *E. resinifera*. [See also Plate 126.]

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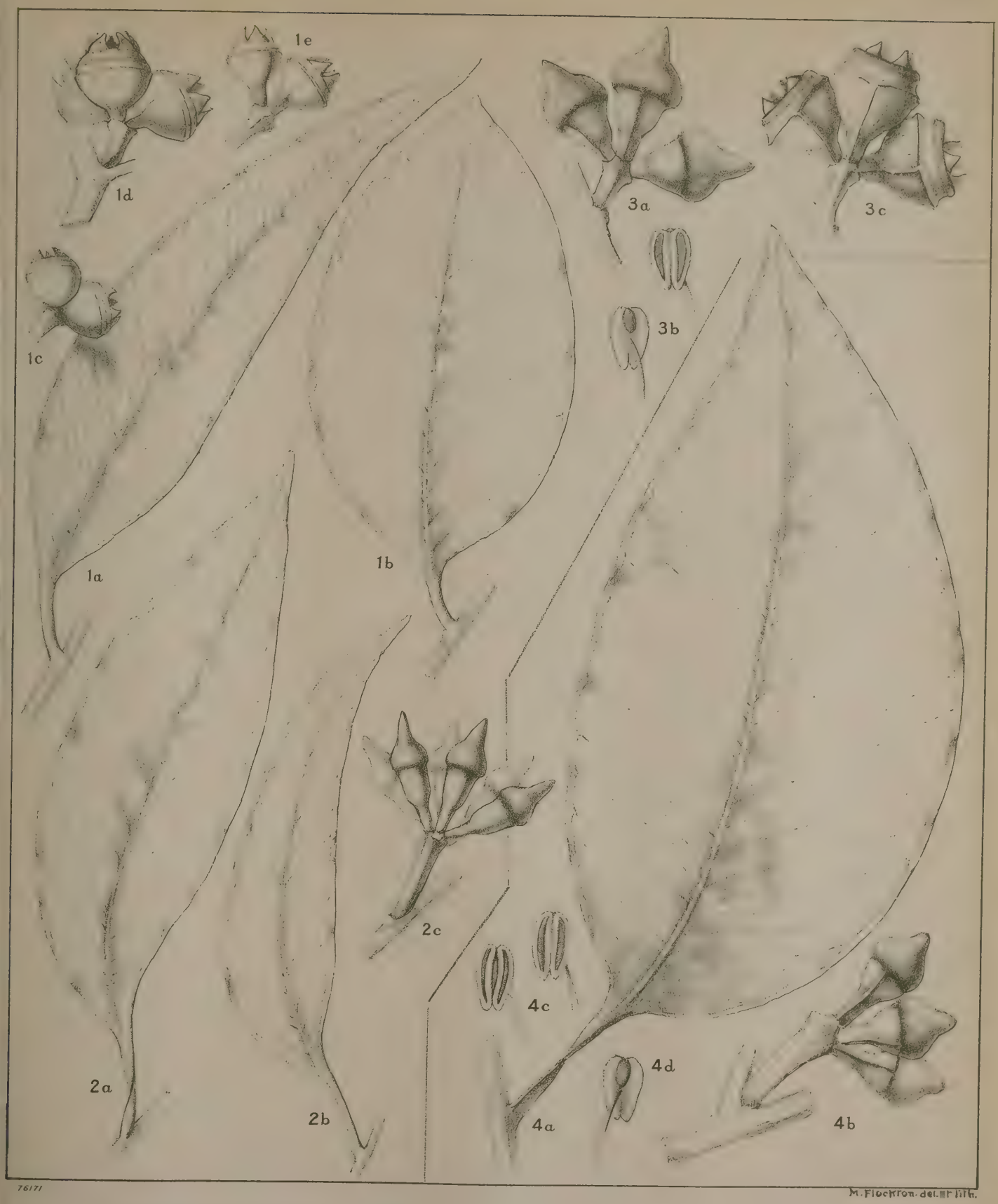

EUCALYPTUS PELLITA F.v.M. (*1–3*). Continuation of transit forms from Plate 125.

E. PELLITA F.v.M. (*4*). Type. [See Plate 127.]

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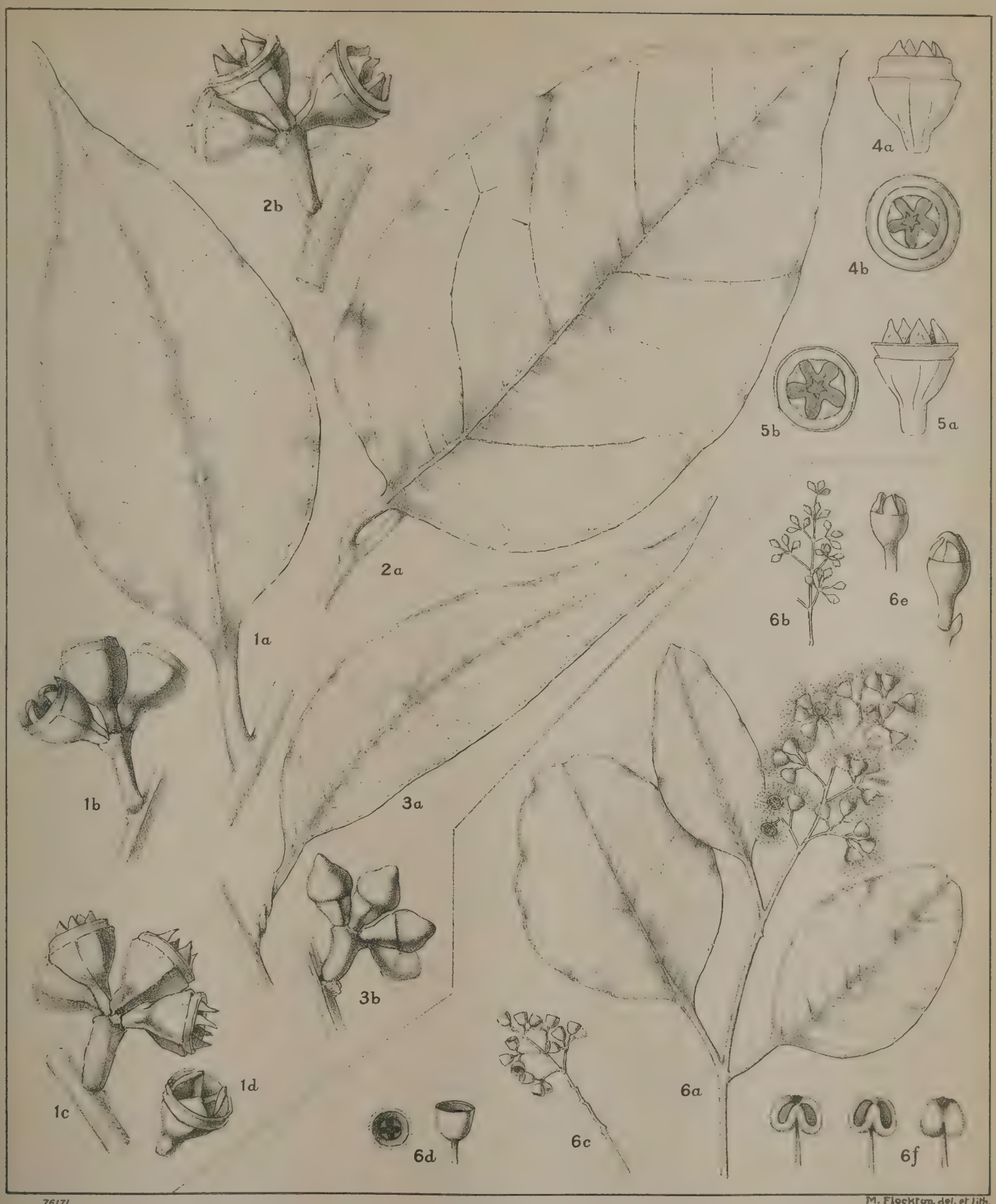

EUCALYPTUS PELLITA F.v.M. (*1–3*). [See Plate 126.]

E. BRACHYANDRA F.v.M. (*6*)

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